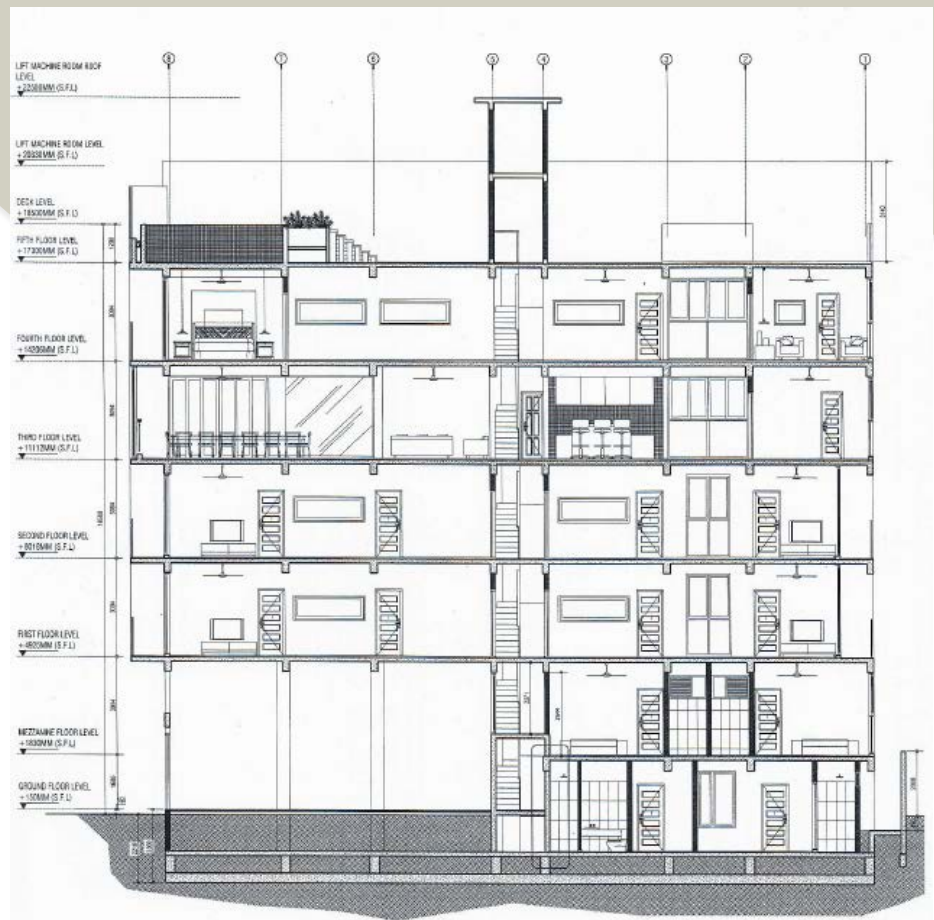


ENVIRONMENTAL IMPACT ASSESSMENT FOR PROPOSED SIX STOREY BUILDING WITH A BASEMENT, LAND LOT A-10079 HULHUMALÈ, MALDIVES



PREPARED FOR
Ms. Maanaa Raafiu

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Declaration of the Consultant:

I certify that the statements made in this Environmental Impact Assessment are true, complete and correct to the best of my knowledge and available information at the time of writing this report.



Mahmood Riyaz (EIA03/07)
October 2016

Declaration of the Proponent:

As the proponent of the proposed environmental impact assessment for proposed six storey building with a basement, land Lot a-10079 Hulhumalè, I guarantee that I have read the Environmental Impact Assessment report thoroughly and that to the best of my knowledge all information provided here is accurate and complete.



Ms. Maanaa Rafiu

Acronyms used in the text

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DNP	Department of National Planning
EPA	Environmental Protection Agency
EPAA	Environmental Protection and Preservation Act
HPA	Health Protection Agency
HDC	Hulhumale Development Cooperation
MHTE	Ministry of Housing, Transport and Environment
MSL	Mean Sea Level
MWSC	Maldives Water and Sewerage Company
NPC	National Planning Council
STELCO	State Electric Company

2 NON TECHNICAL SUMMARY

1. The report has been prepared for Ms. Maanaa Raafiu M. Kuredhige to fulfill the legal requirement of EIA regulation 2012 Schedule D which requires obtaining environmental clearance from The Environmental Protection Agency prior to construction of a building with a basement or buildings that have a foundation deeper than 5feet from the ground level. The proposed project involves development of a six storey building with a basement in Hulhumalè Lot 10079 (A-133) located on the north eastern side Dhiggaa Magu in Neighbourhood 1 (N1).
2. The total area of the lot is 152.8m² and the building footprint is on 137.5m². The proposed 6-Storey private residential building will have apartments in mezzanine, first, second, third and fourth floors. The terrace will have a 12.5m² swimming pool and a raised deck. The basement will have provision for accommodation on one half and other half for vehicle parking.
3. The inclusion of a basement floor in the building requires the foundation to be laid at a deeper depth than the foundation of a typical building without a basement and so it is proposed to be at 2.11m below ground level. The biggest concern in excavating for this depth is the protection of foundations of the adjacent buildings. Since the foundation depth of the proposed building will be deeper than the foundation depth of adjacent buildings. Detailed procedure to be used to construct the foundation of the building is described in the report.
4. Ambient noise levels, road traffic condition, groundwater, soil, vegetation, and a exterior visual survey of the surrounding buildings and roads have been undertaken to assess the environmental condition of the area.
5. The study showed that the road traffic is extremely low approximately one vehicle in every 1-2 minutes. Exterior visual survey of the surrounding buildings show no significant structural defects apart from the minor surface cracking. Road condition of Dhiggaa magu Nirohmagu 06 Goalhi and Nirohmagu 09 Goalhi are in good condition. It is unlikely the existing road structures will be affected from the proposed development. The land plot is covered with various types' of plants (shrubs and creepers) due to human intervention. The dominating low level bush contains a large number of Ipili pili (*Leucaena leucocephala*) and a medium sized Casuarina plant was found inside the land plot. The removal bushes, creeper and the Casuarina plant from the project area will be insignificant in terms of environmental impacts.
6. The environmental impact assessment study for construction of six-storey building with a basement in Hulhumalè Lot A10079 found that foundation excavation and dewatering and waste are two main activities that would cause significant negative environmental impacts.
7. Of these a long term impact would be from constructional waste. The waste material generated during construction phase needs to be appropriately disposed if not aesthetic conditions of the surrounding environment will be degraded in addition to health risks, dust odour and smell nuisance to nearby residents is anticipated. Hazardous waste such as waste oil and lubricants if not disposed properly it will contaminate and pollute the groundwater. These impacts would be cumulative and can be managed through proper monitoring and addressing them in a timely manner. Based on the scale of the construction projects that is taking place in Maldives at the time of this writing, impacts associated with this project activity is insignificant.

8. Impact of dewatering on groundwater table will be short-term in nature, including loss of groundwater from the project boundary and vicinity. Major impact of dewatering would be increased salinity of ground water within the vicinity areas for a short period of time. Considering the fact that most of the households nowadays are using piped water for daily household uses, there will be no direct impact to the households from increased salinity but the impact would be felt for the trees nearby the site.
9. The study has evaluated alternative options for the project activities and evaluated potential options for power generation and alternative foundation options. Even though there is no very significant impact from this project after the report has come-up with an extensive monitoring programme that will keep on monitoring environmental changes associated with the project and make necessary adjustment based on the findings of various measured environmental parameters suggested in the monitoring plan.
10. The study found that the proposed project is in line with key legal and policies maintained by the Ministry of Housing and Infrastructure and EPA including Environmental Protection and Preservation Act, EIA Regulations, Hulhumalè Planning Guidelines and Maldives National Building Code.
11. Therefore on the basis of this environmental impact assessment study and the impact mitigation measures proposed in the report will be duly implemented and recommendations are given due consideration, it is concluded that the benefits of the proposed construction of six storey building with a basement in Hulhumalè Plot A 10079 will substantially outweigh its imposition on the environment

3 INTRODUCTION

3.1 INTRODUCTION

The report has been prepared to fulfil the legal requirement of EIA regulation 2012 Schedule D which requires obtaining environmental clearance from The Environmental Protection Agency prior to construction of a building with a basement or buildings that have a foundation deeper than 5ft. The proposed project involves development of a six storey building with a basement in Hulhumalè Lot 10079 (A-33) (Figure 1). The primary objective of environmental assessment for the proposed six storey building with a basement is to address potential impacts associated with the structural damage to neighbouring buildings due excavation to place the foundation.

The proposed 6-Storey private residential building will have apartments in mezzanine, first, second, third and fourth floors. The terrace will have a 12.5m² swimming pool and a raised deck. The basement will have accommodation for the house maid and employes on one half and other half for vehicle parking. One third of the Mezanine floor will provide small commercial space. The total area of the lot is 152.8m² and the building footprint is on 137.5m². (Figure 3).

The foundation beam of the raft foundation will be at the depth of 2.21m. The foundation beam will have a cover of 60mm while all the other beams will have a cover of 35mm detailed engineering design parameters are given in Annex 3.

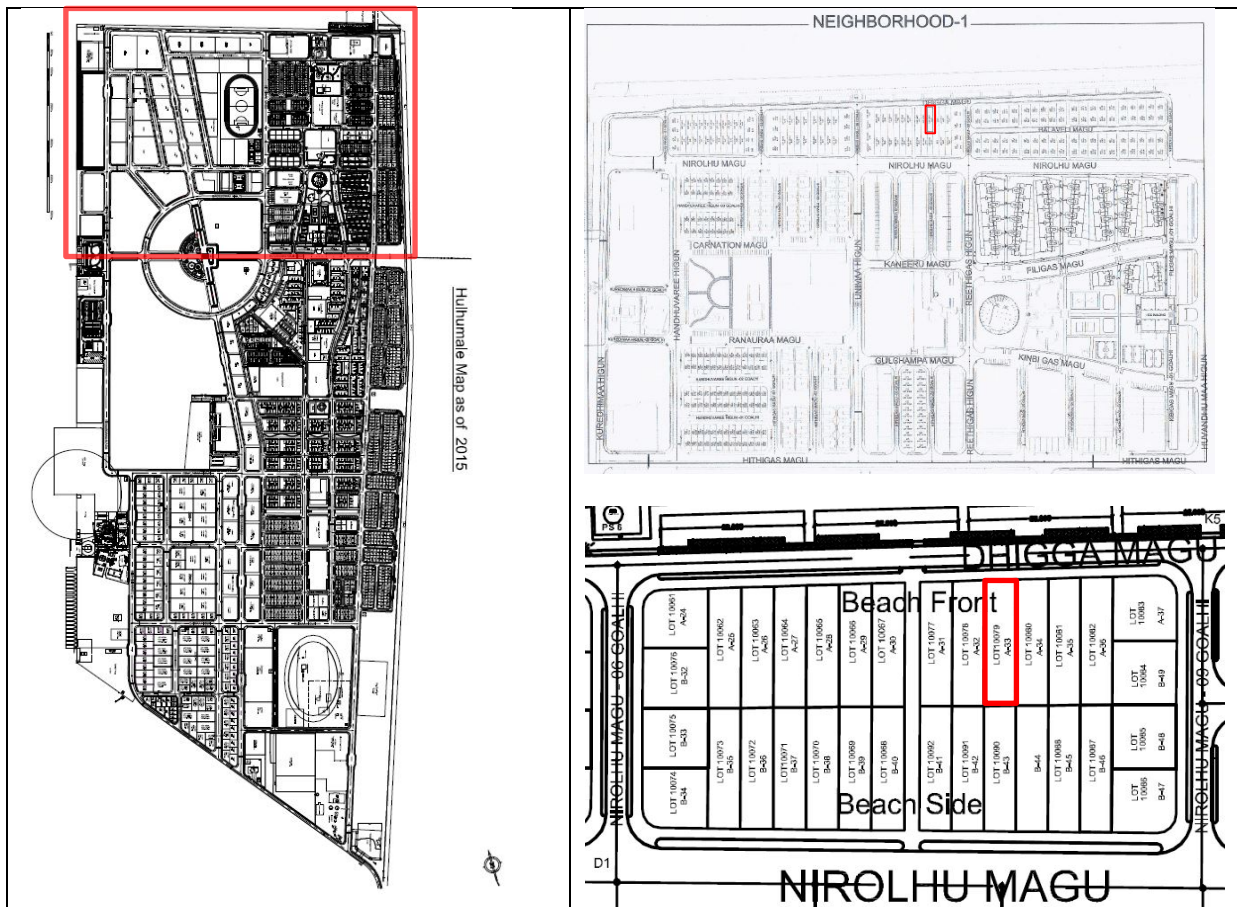


Figure 1: Showing the Hulhumalè neighbourhood one and the location of lot A10079 (A-33)

3.2 PURPOSE OF THE EIA

This report will identify the potential impacts of the proposed project and will recommend mitigation measures to minimize such impacts during the proposed works and thereafter. The report will also look at the justifications for undertaking the proposed project components including alternatives to proposed components or activities in terms of location, design and environmental considerations. Impact mitigation measures and a monitoring programme before, during and after the work would also be included.

The findings of this report are based largely on the engineering design and very rapid field assessment and condition survey undertaken during a site visit made to the project site in September 2016 as well as professional experience from similar undertakings elsewhere in the Maldives. The development concept prepared by the project architect and engineering protocols developed by the project engineer has been utilized in order to understand and present the project.

To fulfil the legal requirement of EIA assessment the proponent has requested the consultant the preparation and submission of an Environmental Impact Assessment (EIA) report to EPA to comply with the Environmental Protection and Preservation Act (4/93) and EIA Regulations 2012.

3.2.1 The objective of the EIA study is:

- a) To provide an assessment of the potential environmental effects of the proposal and to determine the baseline environmental conditions of the project area
- b) Identify, predict and assess environmental impacts that might arise during the construction and operational phases of the project
- c) Evaluate the level of significance and magnitude of environmental impacts that will be generated from the project; identify and suggest environmental impact mitigation measures suitable to the conditions in order to eliminate or minimise the negative impact on the environment;
- d) To assess how the proposals have been developed to achieve a satisfactory level of environmental performance in line with the EIA Regulations

3.3 EIA REPORT AND EIA IMPLEMENTATION PROCESS

In general the objective of an EIA report is to address the environmental concerns of the development project. The EIA will help to achieve efficient planning, aid in identifying impacts and their potential mitigation measures. The EIA report will also help to promote informed environmental and sound decision making during the development of the project.

The aim of the EIA is to identify, describe and assess in an appropriate manner, proposed development, in accordance with the provisions of guidelines and regulations of the GoM, the direct, indirect and residual effects of the project on the following factors:

- Physical and chemical characteristics of the earth (soil, landform, unique physical features), water (marine and underground), atmosphere (air quality and climate),
- biological conditions including flora (trees/shrubs and endangered species), fauna (birds, land animals, coral and endangered animals) habitats (environmentally sensitive areas protected area etc);

- cultural factors including aesthetic and human interest (scenic views and vistas, wilderness qualities, landscape design, historical and archaeological sites and objects), and cultural status (employment); and
- ecological relationships including eutrophication, disease and insect vectors, and introduction of alien species etc..

This EIA report has been prepared by Dr. Mahmood Riyaz registered EIA consultants (Registration no 03/07) at EPA for the Proponent Ms. Maanaa Raafiu. EIA preparation process is as follow:

- 1- The consultant prepares EIA application form with necessary relevant documentations for the proponent for submission to EPA, and the proponent submits the application along with project brief and a draft TOR.
- 2- EPA calls for a scoping meeting with proponent, consultant and relevant stakeholders from government agencies to finalise the draft TOR of the EIA study
- 3- The consultant undertakes literature review and gathers relevant data and information on the project.
- 4- Consultant undertakes the field assessment work
- 5- The consultant analysis data and information gathered and identify environmental impacts, determine mitigation measures, rationally evaluate and suggest alternatives and limitations and propose a monitoring plan.
- 6- The consultant discusses major findings with the proponent and suggests possible changes to the project/project component.
- 7- Based on the discussion with the proponent the consultant reviews the EIA and makes necessary changes to the document.
- 8- The proponent should provide written commitment to undertake mitigation measures and post-development environmental monitoring as per the EIA report.
- 9- The consultant submits the final EIA to the proponent who subsequently will submit to EPA for review and to issue decision note.

Once the decision note is issued from EPA the proponent is obligated to implement the EIA and matters highlighted in the decision note. Also the proponent shall implement the periodic monitoring programme during construction and operational phase of the project and submit monitoring report as indicated in the EIA report.

3.4 SCOPE OF THE EIA AND APPROACH

The scope of this EIA is based on the consultations held during the scoping meeting at the Environmental Protection Agency on 7th Sepyember 2016. The approved ToR highlighted 9 major tasks to be covered including;

1. Description of the proposed project;
2. Legislative and regulatory considerations;
3. Description of the existing environment
4. Potential impacts of the proposed project;
5. Stakeholder consultation
6. Alternatives to the proposed project;
7. Mitigation and management of negative impacts;
8. Development of monitoring plan

A copy of the ToR is attached in Annex 1. The EIA report closely followed the approved ToR for the assessment.

3.5 STUDY AREA

The proposed developmental project is located in Hulhumalè at the north eastern side facing the beachfront. Location of the project is shown in Figure 2.

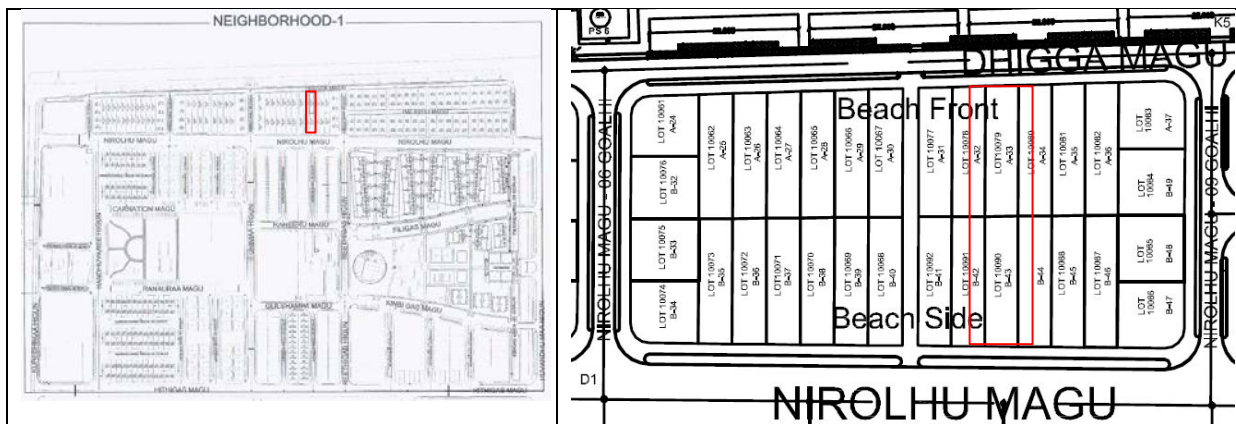


Figure 2: Study area

3.6 PROJECT BOUNDARY

The construction work of the six storey residential building with the basement will take place within the boundary of lot 10079 (A-13). The Figure 3 shows the total land area of the Lot 10079, geographic coordinates and the building footprint of the proposed residential building.

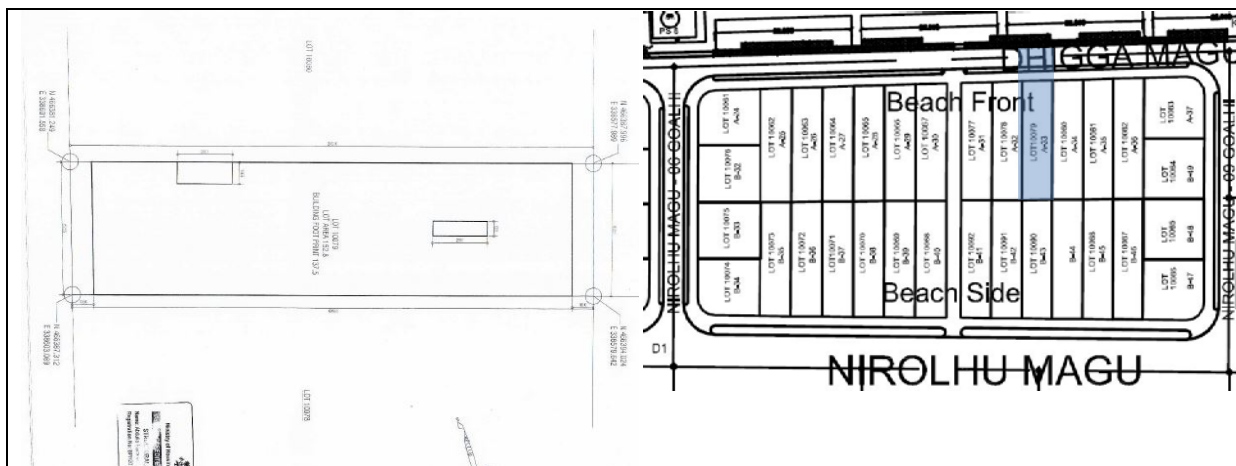


Figure 3: Project impact boundary (shaded area right) and geographic coordinates of Project boundary (left)

3.7 PROJECT JUSTIFICATION

Land is extremely scarce in the Maldives, especially in Malé, the capital city of the country which only has a size of 5.8 km² and a population of 133,412 (Census 2014) making it the most densely

populated island in the Maldives that exceeds 23,000 persons per km². This creates lack of adequate living spaces with several families living in congested spaces. Even for the busy and wealthy people land scarcity and subsequent congestion makes Male not suitable for relaxation during weekends and holidays. Therefore they often need to get away from the crowded and congested environment to a more relaxing retreat. The proposed six storey building with a basement is a residential building that will be used by the proponent and the family for living and as a holiday retreat to get away from overcrowded environment of Male.

As per the HDC building guidelines residential buildings have a height limitation maximum 18.5m and space that can be covered by the roof. Therefore the maximum number of floor that can be constructed in a building is limited for 5 floors above the ground. In these fairly small land plots comfortable space can only be obtained from increase in the number of floors erected above the ground. Average families living with their house maids and own vehicles have difficulties to manage everything within the limited space in the land plot. Therefore the only options that can potentially increase the space are expansion of the building downwards and make maximum use by creating space in the basement. For this reason the proposed six storey building has included a basement to optimise the land by creating living and vehicle parking space in the basement.

The proposed six storey building with a basement will be erected on a raft foundation. This is the most commonly used foundation type in the Maldives. This method is used because the water table is very shallow and fluctuates with change in tide and the soil is less compact and has fairly low bearing capacity. Also the raft foundations have the advantage of reducing differential settlements as the concrete slab resists differential movements between loading positions.

There are also several other socio-economic benefits associated with the project. These include:

- Employment opportunities for local labour force including consultants contractors
- Improved living standards
- Increased potential commercial space and source to generate revenue to local land owners
- Contributes to reducing the congestion issues facing Malé

3.8 PROJECT SCOPE SUMMARY

The project mainly involves construction of a six storey residential building with a basement on Hulhumalè lot A-10079 (A-33). The proposed project involves the following key components:

Preconstruction

- Plot allocation and approvals
- Fencing

Construction

- Mobilization of labour force and equipment
- Mobilization of construction materials
- Building construction works (excavation, dewatering, foundation etc)
- Connection to utility services
- Finishing
- Demobilization

Operational phase

- Provision of utility services
- Provision of municipal services

3.9 EIA IMPLEMENTATION METHODOLOGIES

The findings of this report are based largely on the engineering design and very rapid field assessment and condition survey undertaken during a site visit made to the project site in September 2016 as well as professional experience from similar undertakings elsewhere in the Maldives. Environmental impacts are predicted by use of widely used descriptive checklists and its significances are evaluated by the use of Leopold matrices. Expert judgment and professional opinion as well as review of relevant EIA studies have also been widely used throughout the impact assessment and evaluation process. These methods are described in detail at the relevant section of this EIA Report.

3.10 REVIEW OF RELAVANT STUDIES

As part of relevant literature review and preparation of the report, the following EIA studies on Hulhumalè Lot 10079 (A-13) and establishment of water supply systems conducted in various parts of the Maldives have been reviewed and used as reference;

Environment Impact Assessment Report for Development of Holiday Inn Ameeneege, Malé Maldives, Mahmood Riyaz (2007)

Initial Environmental Examination (IEE) Report G. Javaahiru Asseyri Construction of a 10 Storey Building with a Basement, by Lamer Pvt.Ltd, (2011)

EIA for proposed construction of 385 housing units Hulhumalè island, Kaafu Atoll, Maldives, by CDE Pvt. Ltd (2012)

EIA For the Development of a 10 Storey Building at Umaru Shopping Arcade, Malé, Maldives, WS, Pvt.Ltd, (2014)

EIA, Multi-Storey Building at H. Point Villa Malé City, Maldives, Sandcays (2015)

EIA For Proposed 11-Storey Building Development at M. Thulhaadhooge, Male' by Mohamed Zuhair and Ibrahim Shakir (2015)

EIA for the proposed development of a tertiary hospital at Hulhumalè' by CDE, August 2015

EIA Multi-Storey Building at H. Blue Haven, Malé City, Maldives, by Sandcays, 2015

EIA Tower C of Amin Avenue, Hulhumalè, by Mohamed Zuhair and Ibrahim Shakir, (2016)

EIA Proposed 11 Storey Building Construction in Ma. Andhalus, Male, by Ahmed Jameel and Amir Musthafa, (2016)

EIA for the development of N3-56 and N3-57 plot under the proposed 3,000 housing units project at Hulhumalè', Kaafu Atoll, by CDE Pvt.Ltd, (2016)

3.11 EIA TERMS OF REFERENCE (TOR)

Scoping meeting to determine the scope of the EIA and agree on the Terms of Reference (TOR) of the EIA report with the stakeholder was held at EPA on 7th September 2016. The approved Terms of Reference is attached in Annex 1.

4 DESCRIPTION OF THE PROJECT

4.1 THE PROPONENT

The proponent of the project is Ms. Maanaa Raafiu, M. Kuredhige. Lot No A-10079 (A-33) is registered in her name, agreement no (HDC/LDS/09/621) between the proponent and HDC.

Details of the proponent a given below:

Miss. Maanaa Raafiu
NIC no: (A-034104)
M. Kuredhige,
Male, Maldives
Tel: 7773885
E-mail maana@adkenterprices.com

4.2 THE PROJECT

The proposed project involves the construction of a six- storey building with a basement which will be used as maid's accommodation and a vehicle garage at Hulhumalè Lot 10079 (A13) located on the eastern side in neighbourhood 1 (N1). The building will have residential apartments in mezzanine, first, second, third and fourth floors. The terrace will have a 12.5m² swimming pool and a raised deck. One third of the Mezanine floor will provide small commercial space.

4.3 PROJECT ACTIVITIES AND IMPACTS TO ENVIRONMENTAL RESOURCES

4.4 PROJECT SCOPE

Table 1: Project components and Status of their implementation

Component	Status
Design - concept, architectural, engineering, and structural	Completed
Approval of the design from HDC and Ministry of Housing and Infrastructure	Completed
Preparation of EIA and approval from Environment Protection Agency (EPA)	On going
Selection of construction contractor	On going
Project Mobilization equipment and machinery	Construction stage
Site clearance	Construction stage
Fencing	Construction stage
Excavation to lay the foundation	Construction stage
De-watering	Construction stage
Construction and development of the project	Construction stage
Mixing and application of concrete	Construction stage
Storage and handling of cement and other construction materials	Construction stage
Roofing, plumbing, wood works, tiling and railing	Construction stage
Plastering, painting and finishing	Construction stage
Connection of utilities	Construction stage
Demobilisation	

4.5 BUILDING DESIGN AND CONCEPT

The proposed six storey building with the basement will be developed as a private residential building with all facilities and services provisions. Half of the basement of the building will be used as accommodation for the maid's apartment with bedroom, bathroom, sitting room and storage etc., and the half of the basement will be used as a vehicle parking garage for the owner and building residents. The mezzanine floor will have a two bedroom apartment and commercial space.

4.5.1 Floor plan

First and second floor will have two bedroom two apartments at each floor. The third and fourth floors will be owner's apartment. The third floor will have guest room with attached bathroom, wet and dry kitchen, master dining room large open-air balcony and master sitting room. The fourth floor will have Master bedroom, master toilet and spa, a gym two more bedrooms with attached bathroom and a library. The fifth floor is the terrace with raised open sun deck, day beds and a 12.5m² swimming pool. Floor plan Design and drawings are provided in (Annexes 4a- 4e). All the floors can be accessed either via the staircase or via the elevator that can carry 6 Pax. Some of the general design standards proposed for the building are given below.

4.5.2 General finishing standard proposed by the designers

- 1- 150x150 mm concrete parapet shall be casted at the bottom of all exterior
- 2- 150x150 mm reinforced concrete (RC) mid beam shall be casted at mid height of all walls
- 3- RC lintels are to be provided on top of all doors and windows
- 4- Proper water proofing solutions are to be proposed by the contractor and approved by the engineer
- 5- Steps of the staircase shall be finished with homogenous tiles c/w nosing tiles & skirting approved by the architect
- 6- All floors except toilets shall be finished with 600x600mm homogenous tiles approved by the architect
- 7- All toilets, showers, sluice rooms and their respective lobbies to have non-slip ceramic floor tiles.
- 8- Toilets shower 25mm lower than the FFL of respective floors. All the tiles should be specified by the contractor and approved by the client
- 9- All exterior walls shall be full block masonry c/w plaster on both sides
- 10- "Master seal 550" or equivalent chemical should be applied in all the toilets and balcony floors up to 1 feet high on the walls after screening
- 11- All the walls exposed to rain including open voids should be plastered with "Reomix 720" or equivalent chemical
- 12- "Master tile 30" or equivalent chemical cement should be used for all the tiling.
- 13- "Master tile 530lm" or equivalent should be used for grout

4.5.3 Internal finished standards proposed by the designers

Floor

- Parking area and toilets - 1200mm x 125mm wide tongue & groove timber planks
- FL 2- 600 x 600 ceramic homogeneous floor tiles (semi-gloss finish)
- FL 3 - 300 x 300 ceramic homogeneous floor (non skid)
- FL4 - 600 x 600 ceramic homogeneous floor tiles (non skid)
- FL5 - industrial paint

Skirting

- Parking area - 12mm thick x 100mm high timber skirting for bed room to complete with wood stain & varnish
- Other floors - 12mm thick x 100mm high tile skirting

Wall

- Parking area and toilets - 120mm thick cement blocks with 15mm TK plaster finish. Exterior weather proof paint finish on wall putty .
- Apartments - 600 x 300 gloss homogeneous wall tiles

Ceiling

- Parking area exposed slab with smooth putty finish
- Other areas gypsum board ceiling on timber frame

The conceptual design of the project has been approved by Ministry of Housing and Infrastructure and HDC. The approved design concept of the project is attached in Annex 2. The building design has integrated cross-ventilation and natural lighting as an important aspect for energy saving. A lift will be installed as per the requirements as the building exceeds 6 storeys.

4.5.4 Foundation

The building will stand on a raft foundation. Raft foundation is the most commonly used foundation type in the Maldives. This method is used because the water table is very shallow and fluctuates with change in tide and the soil is less compact and has fairly low bearing capacity. Also the raft foundations have the advantage of reducing differential settlements as the concrete slab resists differential movements between loading positions.

Reinforced concrete raft foundations will be laid after site set-out and excavation, dewatering and protection. Concreting will be done on site. Imported Gravel and river sand will be used for construction work. Foundations will be at a depth of 2.1 meters from ground level. Details of foundation plan is shown in Figure 4.

When all the necessary excavation is complete, a 50 mm thick lean concrete (Grade C15) layer will be laid to provide a level surface to assemble the reinforcement of foundation raft slab and beams. Once the lean concrete layer has hardened, the raft foundation works will be carried out starting with steel work. The concrete works for the raft foundation will be done using C30 Grade concrete. An anti-separation additive would be used to promote bonding of the concrete mix, since the concrete works will be done underwater.

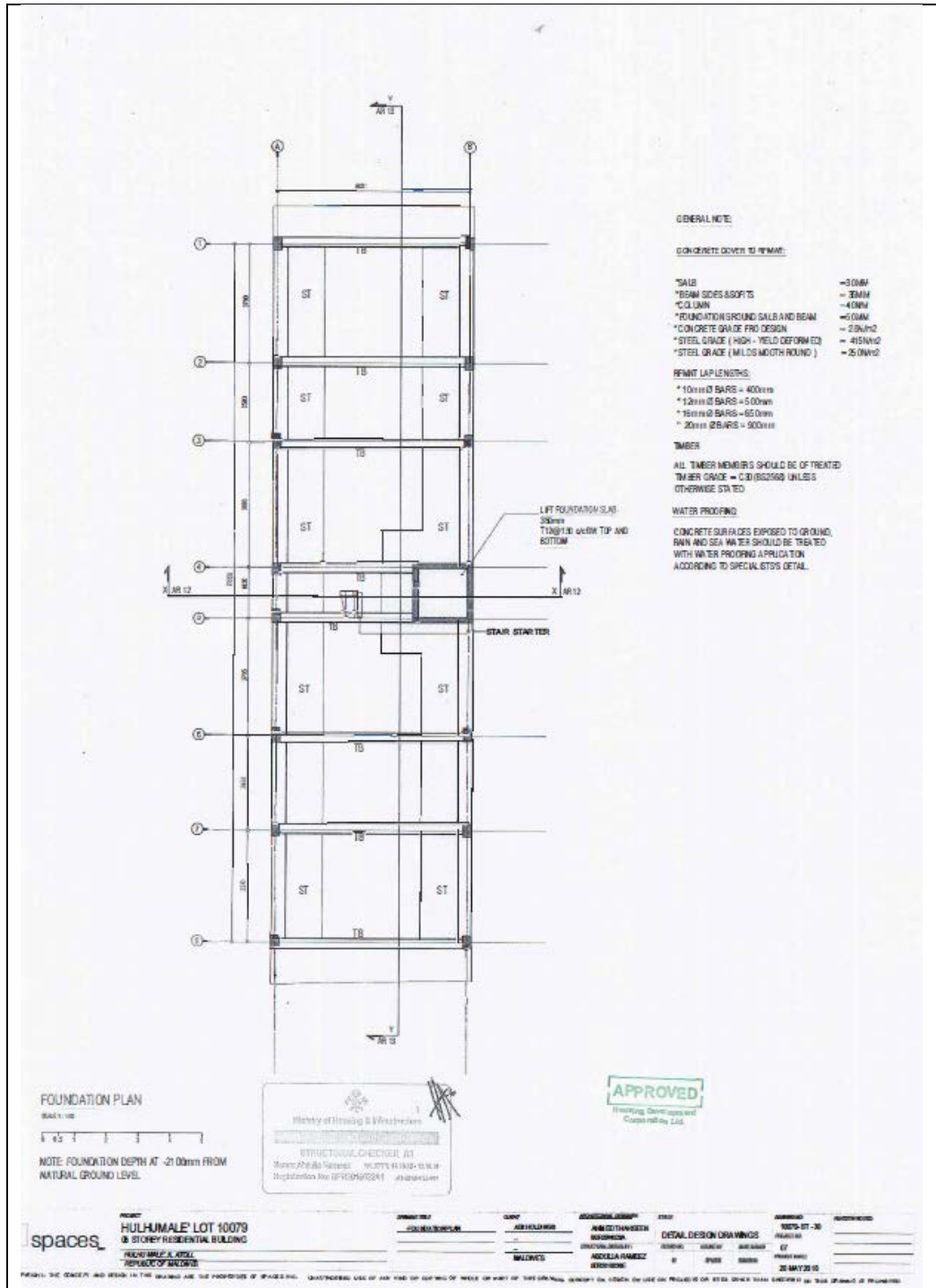


Figure 4: Foundation plan of Lot A-10079

4.6 CONDITION SURVEY OF THE ADJACENT BUILDINGS

A condition survey of the surrounding buildings is conducted for the purpose of this EIA report. Major findings are given in relevant sections in the description of the existing environment.

4.7 CONSTRUCTION PHASE

4.7.1 Preliminaries

Fencing

The area surrounding the land plot will be properly fenced and only authorised person wearing proper gear would only be allowed to enter the fenced area. Security information will be displayed and precautionary signs at the site in location that can be visualized from a fairly long distance will be placed and strictly followed.

Land clearance

Site clearance will require removal of all vegetation from each site. The only notable species on site is the Ipil Ipil (*leuceana leucophella*) trees, which were planted on site during the afforestation efforts of Hulhumalè. It is a highly invasive species and its removal is not considered as a significant impact as the area will be landscaped post-completion of the project.

Green waste will be disposed to a site specified by HDC and waste transportation will follow the regulations set by EPA.

Excavation

The foot print of the building is 137.5m² area will have to be excavated up to a depth of 2.3 m resulting in 316.25 cbm of soil from the land plot. The earth material excavated will be used for back filling and the rest will be disposed to a site instructed and approved by HDC. HDC has not identified a site yet.

Dewatering

The water table is at a ~1.2m below the ground level. The foundation depth is 2.2m therefore dewatering will be required. Dewatering will be undertaken using a pump. The exact amount of water required for dewatering has not been calculated as it required very detailed groundwater investigations. A rough estimate would be 137,000 litre of water needs to be dewatered from the site. Dewatering will be required for foundation laying period only, which may be between 1-3 weeks. Continuous pumping is not expected.

The resultant water will be pumped to a location determined by HDC and it will be disposed as instructed by HDC. During the dewatering process, any important or mature trees in the vicinity of the project site that may be adversely affected due to dewatering would be watered daily to prevent water shortages. Neighbouring household wells will be monitored for salinity and water level to provide adequate compensation to affected parties. Even if regular monitoring was not undertaken, complaints related to groundwater would be resolved.

Scaffolding

The Contractor will provide, erect, maintain, dismantle and clear away at completion proper and adequate including that required for subcontractor and suppliers. Putlog holes shall be made good to match the adjacent surface as the scaffolding is dismantled.

It will be the Contractor's responsibility to have all safety precautions in connection with the scaffolding including the provision of all bracing, scaffold boards, toe boards and the like and for entire sufficiency for the work.

Protection of Adjacent buildings

The foundation of the proposed six storey building with a basement at Hulhumalè Lot 10079 (A-13) will be about 2.1m below the existing ground level. Since the proposed building is with a basement

the foundation normally tend to have deeper foundation therefore basement for the proposed building will be below ground level.

Buildings are construction at the surroundings adjacent plots. To protect the footings that coincide or fall in the same grid will be protected by inserting 300mm x 6mm MS sheets into the ground over lapping each other to a depth of at least 400mm below the proposed excavation depth with 65x65mm Angle bracing held by 100x75mm timber bracing for foundation protection. For protection of existing walls along the western perimeter of the proposed site, it is proposed to be done in parts so as to prevent loosening of soil from the bottom of existing foundations and partial excavations shall exceed a width of 0.6m at a time and masonry retaining wall must be completed immediately after the excavation. Engineer has recommended using solid concrete blocks for the masonry works and allowing at least 24hour intervals between each excavation. The foundation protection method approved for the proposed building is shown in Figure 5.

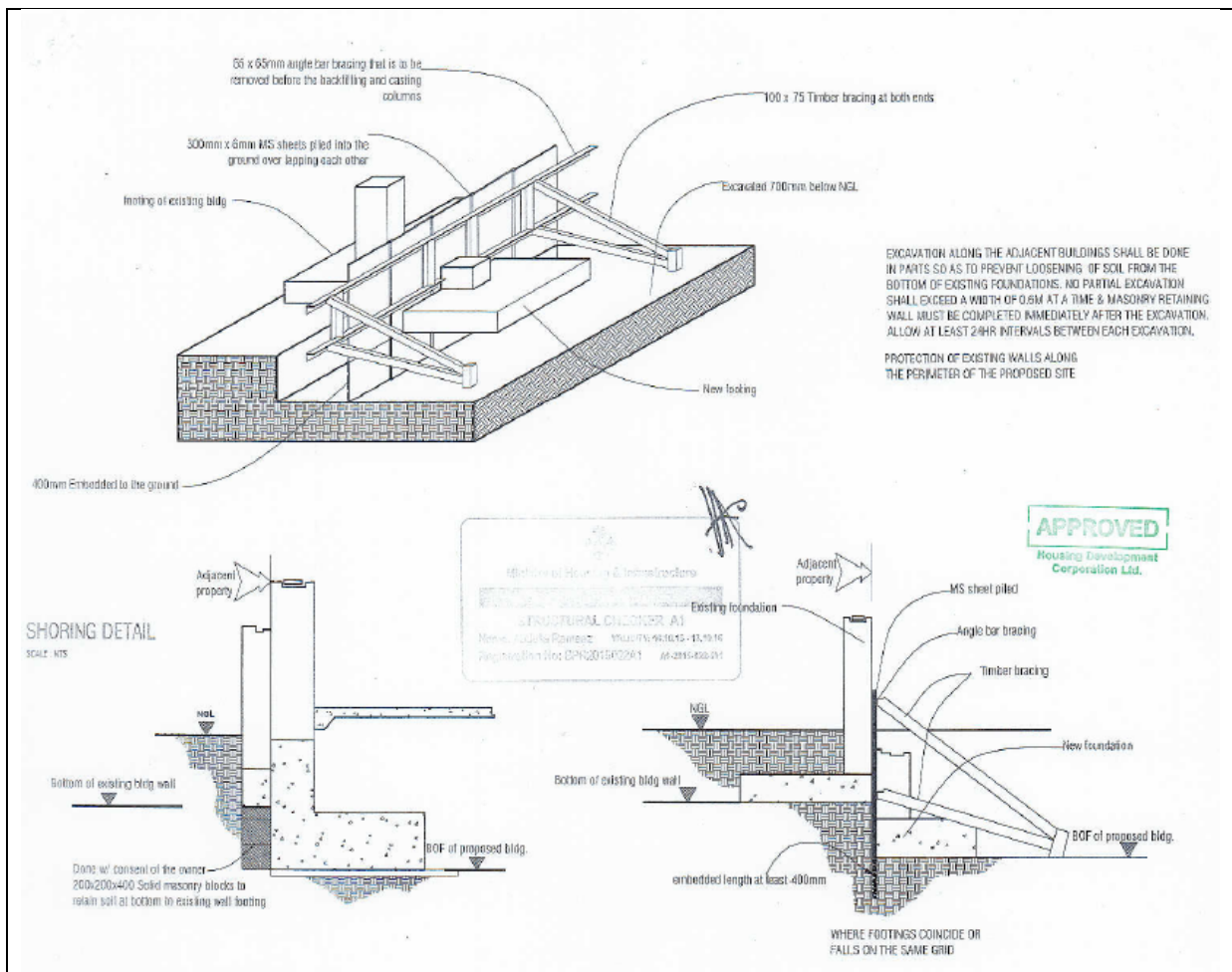


Figure 5: Approved method for protection of adjacent building

4.7.2 Project mobilisation and temporary setup

Clearing the bush (low vegetation) and fencing of the site and mobilization of the project will commence once EIA is approved. Full mobilization of the project will be undertaken once the fencing work is over necessary protection and excavation permit obtained from HDC. The contractor will responsible for the staff accommodation and providing the protection for construction material and equipment on site. Construction workers and staff will not be accommodated on site they will commute to work daily. The site will have 24x7h security hence a temporary security post will be constructed.

4.7.3 Labour Requirements

Table 2: Tentative list of labour requirements is given in Table x.

Category	Quantity
Labour	15
Supervisor	2
Special equipment operators	2
Administration	3
Security	4

Specialist labour will be required to undertake specific tasks. A total of 26 temporary employment may be created through the proposed project. However, no specific quota for local or foreigners have been established.

4.7.4 Utilities

Energy needs during the construction phase of the project will be met through existing STELCO electricity grid in Hulhumalè. It is estimated that between 10-15kW of electricity per day may be necessary during the construction phase of the project mainly to operate construction machinery such as concrete machinery, lighting, lifting, etc.

Water demand for the construction work will be met by connecting to the existing MWSC water desalinated water network. Estimated amount of water required for the construction work is within 1-3 cbm per day. Bottled water from nearby shops will be purchased and used for drinking. Groundwater will not be used during the construction.

4.7.5 Environmental monitoring during construction activities

The Environmental Monitoring the construction phase will focus on impacts of excavation and dewatering to the buildings at the vicinity of the project. Onsite structural engineer will attend the complaints and inspect excavation and dewatering works and keep daily logs of start and end times of relevant works. Assess structural damages against the baseline condition survey of the adjacent building by engineer prior to start of work and upon completion of work. Ground water of the area will be checked once or twice during the dewatering period to check for salinization of the ground water. Test records will be kept for future comparison and monitor the salinity level of the ground water.

4.7.6 Excavated soil /construction waste management and disposal

During the preliminary phase soil excavated from will be disposed of areas designated by the HDC. The contractor will ensure that the waste is properly handled as per the EPA guidelines and EPA licenced party to meet with regulatory requirements of waste management regulation. Part of the excavation material will be used for backfilling after laying the building foundation.

It is estimated that during the construction phase, the project will generate 1-3 tons per day which will be collected on site, transported to the waste disposal site at Hulhumalè. None of the waste will be placed outside the project boundary at any time. Temporary waste storage will be within the project-demarcated area.

Construction waste generated during the construction period, will consist of mixed sand concrete, empty cement bags, wood and wood pallets, iron, steel, paint, plastics, broken pieces of concrete

blocks, nets, rods, cardboards, etc. Construction waste transported and disposed of at the designated waste management site in Hulhumalè on daily basis after completion work.

All waste generated during construction phase and finishing phase will be collected at the end of each work day and transported and disposed off the designated waste management site at Hulhumalè. Handling and transportation of both excavated soil and construction waste will be outsourced to EPA Licensed parties to meet with regulatory requirements of waste management regulation. Standard practices during waste handling and transportation will be ensured.

Hazardous waste such as empty paint cans will be kept separate and disposed according to the standards established by EPA.

4.7.7 Water proofing of basement area

Water proofing of the basement area is very important as part of the basement will be used for accommodation. All the necessary facilities such as toilet bedroom sitting room and storage etc., will be provided in the basement floor. Since the existing sewerage network in Hulhumalè is a gravity system one of the concerns raised during the scoping meeting was that extra pumping mechanism may be required to connect the existing system and prevent flooding of the toilet and basement areas.

To prevent potential flooding the entrance to the basement is raised 150mm above the ground level and the mezzanine floor entrance is about 1.8m above the ground level. All the walls of the basement will be concealed with water proofer and a water sealer with appropriate chemical treatments. The water proofer expands as it dries to become part of the wall. The water sealer will act as waterproof concrete as it take moisture of the wall to form its waterproof crystalline structure.

Water will be pumped out from a sump installed at the basement regularly. The sump will be connected with a perforated drainage pipe to collect water and then pumped out from the well.

4.7.8 Backfill

Hard and dry material excavated from the site will be used for back filling after the laying the foundation. Dry density of the material used for backfilling will be 1600 kg/m³. The following is a list of standard procedure followed for backfilling foundation excavations.

- The backfill of excavations shall be placed in horizontal layers not exceeding 300mm in thickness. Each layer shall be compacted by hand or other mechanical means to the required density before the next layer is added.
- Care shall be taken when filling or back-filling to avoid any wedging action or eccentric action upon or against the structure of the work.
- Before placing of fill, the surface of the sub-grade shall be compacted at optimum water content to the same percentage of maximum dry density required of subsequent lay.
- The Consultant will inspect all compacting devices that the Contractor proposes and shall have the right to reject any device which he feels is unsuitable for the job.
- Heavy equipment for spreading and compacting fill and backfill shall not be operated closer to walls than a distance to the difference in height between the top of the footings and the layer being compacted.
- When back-filling behind retaining walls, basement walls and the like the said structures shall be kept propped during the complete operation. The hydraulic compaction of fill shall not be permitted and the back filling shall be carried out in layers not exceeding 150mm thick.
- Each layer shall be compacted to 90% of the modified compaction. No back filling shall be carried out until the wall concrete has achieved its full works cube strength and care shall be exercised so as not to damage the external tanking membrane and its protection.

4.7.9 Construction methodology

For each casting, materials will be controlled and stored outside the site with the permission from HDC. Once the main substructure casting is over, site will be backfilled up to the basement floor slab bottom level. While casting of components, quality of the concrete will be tested on site using slump cone apparatus. To achieve the required strength, precautionary measures will be taken to maintain concrete mixing consistency, recommended admixtures will be added to concrete and further strength will be verified from the cube results. General construction material to be used are specified below (Specific details provided in Annex 3):

- Cement : Ordinary Portland cement
- Sand: Imported river coarse sand
- Aggregate: Imported 20mm thick aggregate
- Steel – 415 grade steel

4.7.10 Road closure and traffic diversion

The proposed building is located at Dhigga Magu and access to the Lot is generally from Dhigga Magu which is the outer most main road of Hulhumalè. The lot is within the block between Nirolhu Magu 6 goalhi and Nirolhu Magu 9 Goalhi.

Traffic flow in Dhigga Magu is N-S direction. Prior to casting of excavation and foundation permit will be obtained from HDC and permission for road blocks from Dhigga Magu-Nirlhu Magu 06 Golhi junction and Dhigga Magu-Nirlhu Magu 09 Golhi junction is required and the traffic from N-S will be diverted to Nirolhu Magu Goalhi 6. Sections of the Dhigga Magu may be made to open for at least Cycles and Pedestrians. The foundation work is estimated to take around 6-10 hours while the concrete slabs for the rest of the floors will be around 5-8 hours.

4.7.11 Health and safety

Occupational health and safety issues will be dealt with at all times during the construction process of the proposed project. Protection of employees from likely adverse effects will be one of the core duties of the Proponent or Contractor. Health and safety briefings will be undertaken on a regular basis. All machineries and equipment must be operated by trained and experienced personnel wearing necessary safety gears. Noisy or dusty works would be minimized or stopped during peak hours to reduce dust and noise related pollution for pedestrian residents and beach users. Construction safety measures such as safety nets all around the building framework will be placed at all times. Other safety measures such as use of welding masks and use of safety belts will be made mandatory. Barricades, warning signs will be placed on the road during casting or works involving the use of roads such as power, water and sewer connections. Safety of pedestrians and vehicles will be ensured by appropriate signage, safe scaffolding and netting some of which are shown in the following Figure 6.



Figure 6: Commonly used safety signs in construction sites

Workers would be informed of local values, respect for religion and culture in addition to health and safety issues at site. Engineers and/or supervisors will brief workers as and when necessary and ensure safety precautions are in place. Personal protective equipment will be made available to all workers. First aid will be available at site for minor injuries. For serious and emergency issues, injured will be immediately taken to Hulhumalè Hospitals for treatment.

All required equipment will be made available. In this regard, all construction workers will wear safety clothing including overalls, gloves, safety helmets, masks and safety boots during work at all times. All workers and personnel entering the premises will be given hard hats and safety shoes.

4.7.12 Demobilisation

Demobilization plan depends on the contractor. In general, the proponent advocates a phased demobilization plan to commence in the last month of the contract. Demobilization will be undertaken after completing required construction works and finalization of the project. Upon demobilization of equipment and site inspection by the concerned HDC, EPA, Maldives Energy Authority (MEA), etc., may be requested.

4.8 OPERATIONAL PHASE

Key activities identified throughout the operational phase of the proposed buildings would be building maintenance, energy and water conservation, waste management and general maintenance of the building. Following are the aspects that will be covered during the operational phase of the project.

4.8.1 Energy conservation

Electricity requirements during the operational phase will be obtained from the public electricity grid in Hulhumalè provided by STELCO. It is estimated that around 10-40kW of electricity per day will be required during the operation. The existing installed capacity can meet the electricity required for the proposed six-storey building with the basement. The proposed building will be fitted with energy-efficient fittings, including light bulbs and energy efficient non HCFC based inverter type air-conditioners. Solar water heating would also be considered.

4.8.2 Water conservation

All freshwater requirements for the building will be obtained through the public water supply network provided by MWSC desalinated plant in Hulhumalè. Estimated water consumption for building is within the range 2-7m³ of desalinated water per day. For the purpose of discharging all wastewater from toilets, kitchens, laundries, etc will use the main sewerage network of MWSC.

4.8.3 Waste management

During the operational phase of the building, covered large waste bins will be provided at the ground level for all residents to place their waste and for licensed waste management parties to collect and dispose. As the building will be used by approximately 10-15 person maximum waste generation on daily basis will be less than 50kgs. HDC provides municipal waste collection service and there are already established public waste disposal bins in various parts of Hulhumalè. Household waste generated in the building will be segregated disposed off at the nearest public waste disposal bin.

4.8.4 Maintenance

The building will be managed and maintained by the staff employed by the proponent. These include regularly checking for damages and undertake repair works, undertake services requirements such as cleaning, security and servicing to the building. Fire safety and fire fighting equipment on each floor and regularly checked by service providing companies. Maintaining a good and healthier environment outside of the building will be ensured and security personnel will be looking after the security of the building.

4.9 PROJECT DURATION AND SCHEDULING

The project is expected to take approximately 1 year to complete including the time needed for seeking necessary approvals after the EIA Approval. The main milestones include; obtaining approvals, mobilization, excavation and foundation, dewatering, construction work Roofing plumbing wood works, tiling and railing, plastering, planting, finishing and demobilisation. Table 3 shows the project schedule.

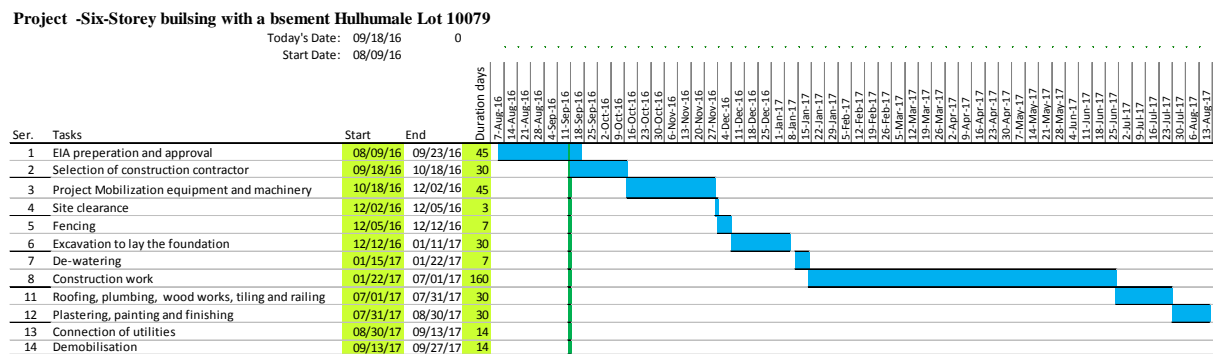


Table 3: Project Schedule – Indicative

Table 4: Matrix of major inputs to the project

Input resource(s)	Source/type	How to obtain resources
Construction Workers	Skilled and semi-skilled labour, Labour (15) Supervisor (2) Special equipment Operator (2)	Trained and licensed staff of the contractor
Machinery (excavator, , operational tools)	01 excavator 02 Pickup truck 01 Concrete machine Other operation tools	To be obtained and operated by the contractor. Contractor will be required to bring to the site machines in good working conditions to avoid loss of time due to breakdown of machines, vehicles and equipment.
Construction material	Construction materials: timber, sand, cement, aggregate, reinforcing steel bars, electrical cables, circuit boards, PVC pipes, HDPE pipes, pipes, building blocks, tiles, plywood, gypsum board, diesel, petrol lysaght roofing material, paint, varnish, chemicals, thinner, nets, etc	import, locally obtained, contractors material
Spare parts	Spare parts for all machineries	Contractors and local suppliers
Water and Electricity	Water and electricity needed during	Water from MWSC water network, electricity from STELCO public grid
Telecommunication and TV cables	Telephone and cable TV services	From local service providers
Output	Anticipated quantities	Comments
Excavated material Dewatering	Soil and sand Water	Part will be disposed off other part will be used for backfilling Water disposed off appropriately
Construction Waste oil and lubricants	Minor amount	Gathered in a barrel and sent to Thilafushi through existing waste management system
Waste during operational phase	Minor amounts municipal solid waste and kitchen waste	Appropriately collected and disposed to the designated municipal waste management area in Hulhumalè
Construction Noise and light	Localized	Excavator and truck operation will generate some noise during the project execution. Work will not be carried out late into the night to avoid disturbance to local population.
Sewage	Minor amount	Connected to the MWSC sewerage network

5 REGULATORY CONSIDERATIONS

This section highlights relevant government stakeholders, their roles and reviews relevant legal framework applicable to the proposed project.

5.1 MINISTRY OF ENVIRONMENT, ENERGY & WATER

The Ministry of Environment and Energy (MEE) is key Ministry in the government mandated with the protection of the environment. Environmental responsibilities assigned to MEE includes formulating environmental policies, coordinating, preservation and management of the environment throughout the country, and enforcing Environmental Protection and Preservation Act (EPPA) (04/93). Under Article 5(a) of EPPA, Environmental Impact Assessment (EIA) is mandatory for projects that may cause potential harm to the environment. The EIA report has to be submitted to the EPA for approval before commencement of a project. As per this legislation, any project that has any undesirable impact on the environment can be terminated without compensation by MEE.

5.2 ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA is the key regulatory body on environment, which is an autonomous body formed under the umbrella of MEE. It is mandated with implementing the EIA process in the Maldives, implementing the Environment Act and subsequent regulations on behalf of MEE, regulating water and sanitation, biodiversity conservation, waste management and coastal zone management. Also, it is responsible for developing environmental standards and guidelines in the country.

5.3 LEGAL FRAMEWORK

Four regulations pertaining to the proposed project have been reviewed and the project's conformity to these has been assessed.

- a) EIA Regulations 2012
- b) Regulation on Waste Management
- c) Regulation on dewatering
- d) Regulation on Environmental Damage Liabilities
- e) Regulation on Management, Use and Control of HCFC Substances and Ozone Layer Protection Act

5.3.1 EIA Regulations 2012

The most important governing law as far as the environmental impact assessment is concerned is Environment Protection and Preservation Act (Law No. 4/93) (EPPA).

EPPA mandates all development projects in the Maldives to undertake an Environmental Impact Assessment prior to undertaking any such project.

Further the EPPA states an impact assessment study shall be submitted to the relevant Government authority before implementing any development project that may have a potential impact on the environment.

It goes on to say that the relevant Authority of Government shall formulate the guidelines for environmental impact assessment and shall determine the projects that need such assessment as mentioned in above.

The law also gives power to the relevant Government authority to terminate any project that has any undesirable impact on the environment. A project so terminated shall not receive any compensation.

According to the EPPA waste disposal, oil and poisonous substances any type of waste, oil, poisonous gases or any substance that may have a harmful effect on the environment shall not be disposed within the territory of the Maldives.

Government of Maldives reserves right to claim compensation for all the damages that area caused by the activities that are detrimental to the environment.

5.3.2 Environment Impact Regulations, 2012 & other relevant regulations

Under the provisions of EPPA the Government of Maldives has formulated and gazetted Environmental Impact Assessment Regulations (2012) detailing the EIA process and the EIA preparation.

In addition to EIA regulations, other relevant regulation will be followed in development and implementation of the proposed project. These regulations include ban on coral mining. Coral mining from house reef and atoll rim reef has been banned since 1990. Sand mining from any island has also been banned since March 2000.

The EPPA, EIA Regulations and other relevant regulations will be duly taken into consideration in preparing the EIA report and in the implementation of the project.

5.3.3 Regulation on Waste Management

Waste management Regulation (No. 2013/R-58) is more recent coming into effect on 6 February 2014. The regulation was gazetted on 05 August 2013. The regulation provides set of comprehensive guidelines on collecting, storing, transporting and managing waste. In the preamble its states the objective of the regulation is in line with the Article 22 of the Constitution which requires that development activities designed for achieving socioeconomic targets should ensure that environment and its constituent living component is not compromised and that resources are utilized effectively.

The regulation talks of the responsibilities of collection, transport, treating and storage of waste. It also talks of management centres and landfill sites and managing hazardous waste. Various sectors and entities (including tourist resorts) encouraged having their own waste management plans consistent with the Regulation.

EPA is the implementing agency of environmental law and the implementing agency of the EIA regulation.

Wastes produced from the project will be disposed in compliance to this regulation.

5.3.4 Dewatering Regulation

This regulation is drafted under the Act number 4/93 (Maldives Environment Protection and Preservation Act) and issued on 31st December 2013. The main purpose of the regulation is to minimize the impact of dewatering activities on ground water table and also to decrease the impacts on the receiving environment of the disposed water. The regulation encourages prevention of contamination and damage to ground water table, protect the living organisms as well as the environment from the negative impacts due to dewatering activities. This regulation is to be enforced by EPA of the Maldives.

If dewatering is to be carried out for any development purposes in any of the islands in Maldives, it shall be done by gaining a written approval from the enforcing agency or an agency assigned by the enforcing body. However, dewatering done at individual level i.e., from a bore well or for the purpose of installing a bore well and water drawn for agricultural purposes are considered exceptions from the regulation.

Dewatering can only be to be carried out, after gaining approval by submitting “the dewatering approval form” in the annex 1 to the enforcing body for approval with all the required documents expressed and with an administrative fee of Rf500. Water quality tests results also have to be submitted as one of the required component.

The regulation also guides on where and how the extracted water shall be disposed of, and how it has to be handled. According to the regulation, permission can be granted for dewatering at a stretch for a maximum of 28 days, for which a sum of MVR500 should be paid per day. This amount is liable to be increased with the number of days increased. A fine not exceeding Rf100 million may be charged for violation.

This will require pumping water during excavation works. The proponent will be required to get an approval from EPA before commencing excavation.

5.3.5 Regulation on Environmental Damage Liabilities, (R- 2011-9)

Under the Environmental Protection and Preservation Act (No. 4/93), the Ministry of Housing and Environment formulated the Environmental Damage Liabilities Regulation in February 2011, which encompasses the basis to avoid environmental deterioration, extinction of biological resources, environmental degradation and avoid wastage of natural resources. The main purpose of this regulation is to stop unlawful activities on environment and adequately implement a fining procedure for violations as well as implement a compensation mechanism on environmental damages. Its Schedules form the basis for levying fines on various environmental components and activities. One of the key objectives of the environmental liability regulation is also to practice polluter-pay-principles in the Maldives.

Hence, the proposed project will be subject to this Regulation for any activity outside of the EIA scope and Environmental Decision Statement.

5.3.6 Regulation on Management, Use and Control of HCFC Substances, 2010

The HCFC Regulation is developed under the Environmental Protection and Preservation Act (4/93) towards regulating phasing out of import, use, selling of HCFC substances by 2011 and completely eliminating use of HCFC substances in the Maldives by 2020 through controlling importers, registering importers, establishment of a quota system, control mechanisms for selling, maintenance of import, selling, purchase and service providers statistics. Under Ozone Layer Protection Act 14/2015 the government has banned import of HCFC based equipment starting from 31st May 2016.

5.4 BUILDING CODE

The building code hand book of Maldives details the guidelines and standards that should be used for designing building in Maldives. All construction projects are required to meet the standards specified in the building code. All construction activities of the project will follow the Building code.

The registered architect and engineer ensures that project has been designed according to the building code of Maldives.

5.5 PERMITS REQUIRED FROM HDC

5.5.1 Approval of the concept and site plan

The HDC will have to approve the concept plan and site plan for the proposed project before the EIA could be approved. This project has approval from HDC (See Annex 2).

5.5.2 Request for Lot boundary delineation

It is required to fill and submit a form to HDC to delineate the boundary of the building prior to commencement of fencing for construction. Necessary form that needs to be completed to delineate the lot boundary, excavation permit, and building usage are available at the HDC website. These regulations and necessary forms are available for downloading at the HDC website

5.5.3 Excavation Permit

Excavation permit from HDC has to be obtained prior to commencement of excavation to lay the building foundation.

5.5.4 Request for foundation check

Prior laying the foundation of the building foundation check request should be sent to HDC by filling a designated form prepared by HDC. The building cannot be erected on the foundation unless the foundation has been checked and approved by HDC inspectors.

5.5.5 Building usage permit

This permit should be obtained from HCD prior to using the building for any purpose. A request could be filed through submitting a completed form prepared for the designated purpose.

5.6 PERMITS REQUIRED FROM EPA

5.6.1 EIA Approval

The most important environmental permit to initiate project work would be a decision regarding this EIA. The EIA Decision Note, as it is referred to, shall govern the manner in which the project activities must be undertaken. This EIA report assists decision makers in understanding the existing environment and potential impacts of the project. Therefore, the Decision Note may only be given to the Proponent after a review of this document following which the Ministry may request for further information or provide a decision if further information is not required. In some cases, where there are no major environmental impacts associated with the project, the Ministry may provide the Decision Note while at the same time requesting for further information.

5.6.2 Dewatering Permit

A dewatering permit is required for the project during excavation works. A separate application will have to be made to the EPA to get the permit. Permission can be granted for dewatering at a stretch for a maximum of 28 days, for which a sum of Rf500 should be paid per day. This amount is liable to be increased with the number of days increased.

5.7 RESPONSIBLE INSTITUTIONS

The main government institutions that have roles and responsibilities relevant to this project are summarised below.

5.7.1 Ministry of Housing and Infrastructure

The Ministry of Housing and Infrastructure is the main agency responsible for overall approval of housing projects. The concepts for the construction of the housing units have been approved by the HDC. Detailed drawings for the housing unit may need to be submitted to the ministry once the EIA has been approved by the Environment Ministry and the project is initiated.

5.7.2 Ministry of Environment and Energy

The Ministry of Environment is mandated for the effective implementation of the Environmental Protection Act of the country and has the statutory power over issues related to the environment. It has the central control over the environment protection, management, conservation and environmental emergencies. The Ministry operates mainly at a policy level and the more regulatory and technical assessment activities are mandated to the Environmental Protection Agency (EPA). In this respect EPA has now been mandated to manage all issues relating to Environmental Impact Assessment of individual projects.

The Ministry of Environment also seeks the advice of National Commission for the Protection of Environment (NCPE) on all significant environmental matters. The commission is appointed by the president and is mandated to advise the Minister of Environment on environmental matters such as environment assessment, planning and management, and political decisions with regard to the protection of environment.

5.7.3 Housing Development Corporation Ltd

Housing Development Corporation is a state-owned enterprise formed with the mandate of managing the Hulhumalè Development project. HDC acts as a master developer, a builder and as a regulator overseeing detailed planning, architectural guidelines and building regulations. A copy of this EIA will have to be submitted to HDC. Guidelines that has been set by the HDC for development has to be strictly followed:

- Planning development Guidelines for residential plots(14th January 2016
- Apartment complex development guidelines (29th December 2013)
- Condominium flats development guideline

Necessary form that needs to be completed to delineate the lot boundary, excavation permit, foundation check and building usage are available at the HDC website. These regulations and necessary forms are available for downloading at the HDC website (<https://hdc.com.mv/downloads/>)

5.8 COMPLIANCE

In general, the proposed development is in compliance with the laws and regulations described above. Additional approvals required before operational stage is mentioned above.

6 METHODOLOGIES

6.1 DATA COLLECTION METHODS

The primary data was collected through the qualitative and quantitative methods of data collection. Qualitative data was collected through filed visits/site walks in the neighbourhood. Specific methodologies adopted to assess various aspects of the environment have been discussed in details in the respective sections of this report.

The secondary data was collected through literature reviews which included a study of the following:

Policies, Acts and Regulations; and
Similar project study documents

In undertaking baseline studies using available data, knowledge and experience have been used. Key issues have been identified during scoping as given in the TOR. Based on the scoping need for further in-depth studies and additional data requirement were identified.

6.1.1 Bio-physical environment

Physical and biological information on the environment was obtained by using appropriate and commonly used methodologies for similar EIA studies in the Maldives. Water sampling and plot boundary location data collected using handheld Trimble GeoXM® GPS. Noise levels in and around the project site was measured by using a sound meter; traffic flow and direction was obtained by undertaking a traffic survey on a working day and a weekend; Vegetation in the site was visually assessed; Water samples were taken by digging a well to water level and sampling it to be analysed at the MWSC laboratory; Climate and metrological data obtained from Maldives Meteorological Services.

6.1.2 Structural condition survey

Structural condition of the existing buildings surrounding the Lot was obtained by visual observation and taking photographic documentation of structural damages.

6.1.3 Socioeconomic Environment

Relevant socio economic data for Hulhumalè was obtained from publicly available published sources. Sources of information are appropriately referenced in the reference list.

6.1.4 Potential uncertainties and data gaps

Most of the environmental impact assessments in the Maldives are often undertaken in a relatively short period of time. Therefore they may not be very robust, accurate and the most comprehensive. Particularly buildings and construction related EIA impacts assessments are very general and can only be improved through experience and from continued monitoring of similar projects. Proper access and assessment of the condition of the nearby structures and adjacent buildings and their structural integrity cannot be properly assessed and evaluated without proper engineering background. This problem is compounded by the absence of long-term studies in other parts of Maldives. Hence, most EIA's end up being based on an environmental snapshot of specific point in time. However, experienced EIA specialists can deliver a close match to reality based on a number of similar assessments. In this regard, the following gaps could be identified in information.

- Little knowledge on geology and geotechnical aspects

- Limited information and access to adjacent buildings and structures.

Efforts have been made to consider and address these gaps in the assessment and in designing mitigation measures and the monitoring programme.

7 EXISTING ENVIRONMENTAL CONDITIONS

Baseline data on the existing environment of Hulhumalè for the proposed six-storey building with a basement would include general geography, demographic status, ecologically protected areas, and other environmental aspects pertinent to the project. A detailed description of baseline data compiled through the surveys and monitoring is provided in this section.

7.1 DEVELOPMENT OF HULHUMALÉ

Hulhumalé is a man-made island through reclamation of the shallow reef flat located on the south eastern end of North Malé Atoll (Figure 1). The Phase I of Hulhumalé reclamation, consisting of 188 hectares, began on 16th October 1997 and was completed by June 2002. The first settlement of Hulhumalé was officially inaugurated on the 12th of May 2004 with a resident population of just over 1,000.

At the end of 2013, Hulhumalé Phase I has reached a population of 30,000, which is the halfway mark of the target population of 60,000 to be achieved at the culmination of Phase I by the year 2020. Hulhumalé Phase II which included reclamation of 240 hectares was completed in 2015, targeted to accommodate a total population of 100,000.

Development vision of Hulhumalé is to establish higher standards in the quality of living in the Maldives. Hulhumalé Phase I and II will be a harmonious combination of residential, commercial and industrial components acting as a catalyst to entice broad based investments in the fields of commerce, education, health, recreation, tourism, fisheries and a number of other related areas by both foreign and local parties.

7.2 TOPOGRAPHY

Average elevation of the island is 2.0 m above the mean sea level. At Ibrahim Nasir International Airport, highest point of the runway is 1.2m above mean sea level and thus has only about 0.5m clearance at highest high water level.

7.3 BIOPHYSICAL ENVIRONMENT

7.3.1 Ground water quality

In order to assess the baseline quality of ground water, samples from the site was taken on 20th of September 2016 for analysis at the MWSC Laboratory. A pit was dug at the almost the center of the proposed development site until ground water was reached. The sampling bottle was washed with the same ground water at the site and the sample was transferred to Malé' sent to the MWSC laboratory for water quality analysis. Laboratory tests results of ground water analysis and the GPS location of the sample is given in Table 5. Ground water from the site will not be used for any purpose during construction or operational phase of the project. However ground water quality assessments can be used as a valuable indicator to monitor seepage or spill of contaminants into the ground during the lifetime of the project activities.

The results show that the groundwater of the site shows that it is free from contamination and do not have potential health risks. Sulphate levels identified to be little high and the salinity level is very low, this may be due the fact that the sample was taken during rainy season where large amount of ground water runoff is seepage into the ground. Groundwater will not be used for any purposes for the proposed development. The original water test result from MWSC is given in Annex 6.

Table 5: Ground water sample laboratory results

Parameter	Ground water
Location (Geographic coordinates)	Latitude: 4.21808N Longitude: 73.545743E
Physical appearance	Cloudy with particles
Temperature °C	21.0
Conductivity $\mu\text{s/cm}$	948
pH	7.92
Salinity	0.47
Hardness Total	560
Total dissolved solids (mg/L)	88

7.3.2 Soil

Hulhumalè is a reclaimed land and no proper soil is developed in the island. To determine the subsurface condition a well was dug manually until ground water is reached. The ground water is 1.1m depth. Generally the subsurface content includes poorly sorted unconsolidated mixed coral sand, coral fragments and seashells. The soil structure of the Lot A-10079 is given below

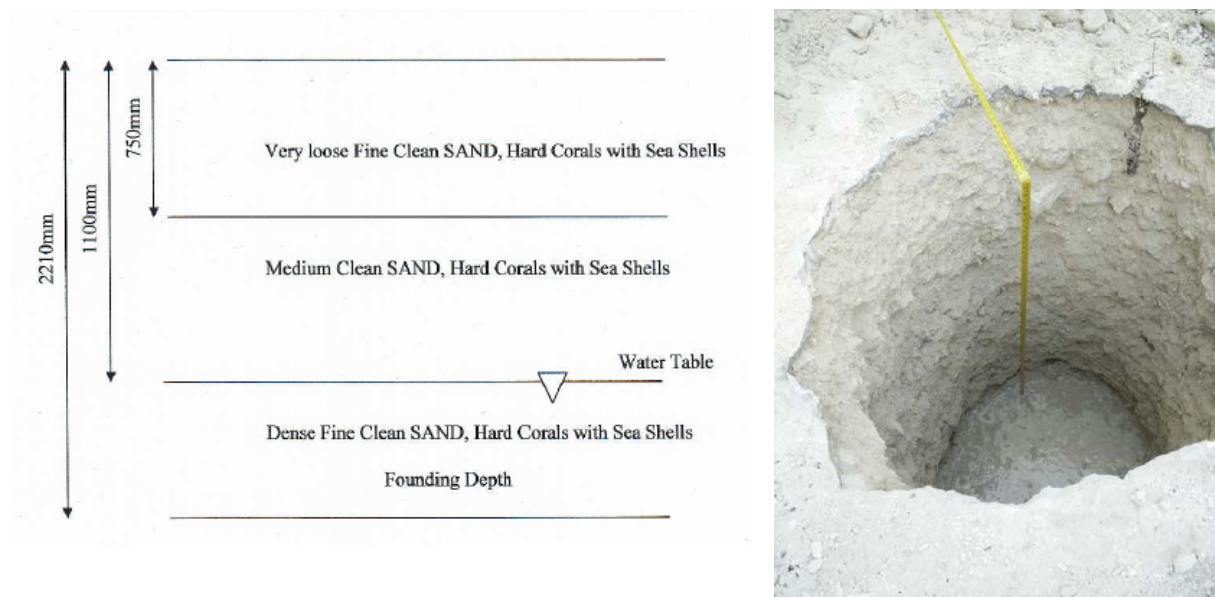


Figure 7: Soil structure at the location of Lot A-10079

7.3.3 Noise level

Ambient noise levels were recorded using a sound meter that comes as an Android Smart phone application. These applications are fairly accurate and user friendly. Noise level was recorded from three different location around the proposed land plot for development. Locations 1# Dhiggaa magu Infront of the Lot A10079, Location 2# Nirolhumagu 06 Goalhi- Dhigaamagu Junction and location 3# Nirolhumagu 09 Goalhi- Dhigaamagu junction. Ambient noise level readings were taken in the late afternoon on 20th September 2016 (Figure 8). Only average noise levels recorded were taken as baseline. Figures shows the maximum minimum and average ambient noise level recorded in three

location and 30second frequency in graphs. The measurements show that in location #1 the ambient noise levels was between 53 and 75 and the average was 67 dB. In location 2# the ambient noise level was between 53 and 75 and the average was 66 dB very close to the range and average in location 1#. In location 3# ambient noise level was between 43 and 87 and the average was 71dB.

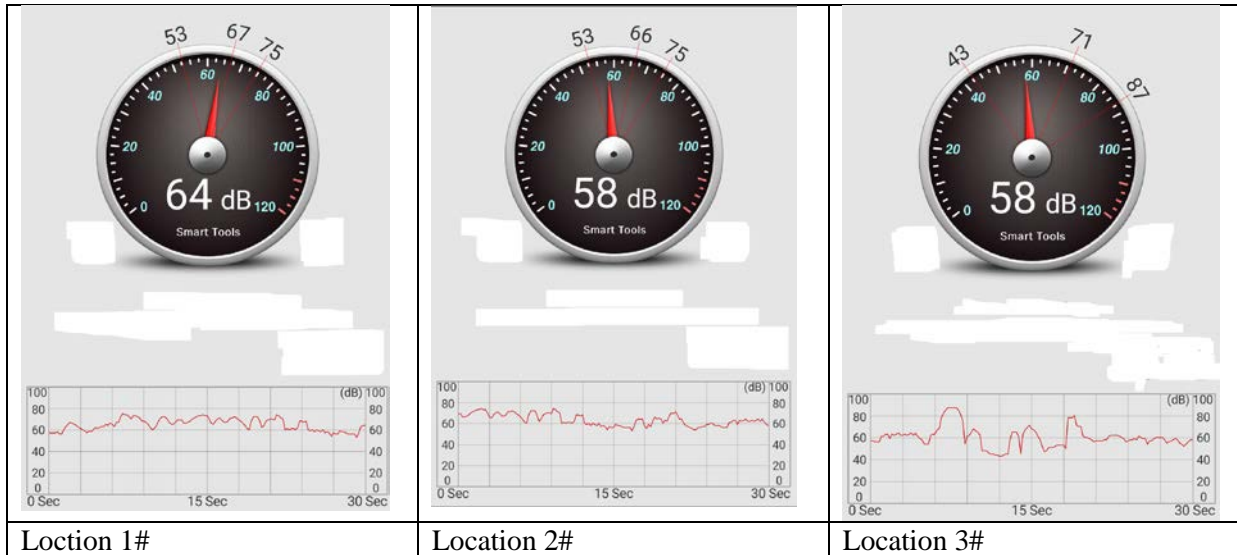


Figure 8: showing the Ambien noise level in decibels (dB)recorded in the vicinity of Lot A10079.

7.3.4 Surrounding buildings

Buildings have already been constructed in all the allocated land plots around the land Lot A10079. Lot no 10078 which lies north, and Lot no 10080 on the south and Lot no 10090 is on the east of the land plot.

Askani Villa built on Lot no 10078 is a guest house, is a relatively new three story building third of the land is left built as free space. The building is used as guest house. Some minor surface cracks were wound on the southern wall of the building, some of these cracks are more than 2-3m long and few mm wide. On the boundary wall connecting the free space with main building fairly large crack was observed and this is widest crack observed in this building at the adjacent wall to the Lot A10079 (Figure 9).



Akiri Vila Entrance Dhigaa Magu



Southern boundary wall Cracking



Southern boundary wall and Eastern boundary wall of Lot 10090



Southern boundary wall



Southern boundary wall Cracking



Southern boundary wall Cracking

Figure 9: Akiri Villa (Lot 10078) condition of southern boundary wall.

Fairly new building is constructed on Lot 10080 which is used as a local residential building. The building has four floors with all the modern fixtures and facilities. The northern wall of the building is heavily cracked and evidence of extensive use of crack sealers were found on the boundary wall adjacent to Lot A-10079 (Figure 10).





Figure 10: Lot 10080 condition of the boundary wall

The entrance to the building on lot A10090 is in Nirolhumagu, Jilbab store. The eastern wall of this building is adjacent to the Lot 10079 on the western side. The eastern boundary wall of the building marks the western boundary of the Lot A10079. The building seems to be still under construction but people are living in this building. The eastern boundary wall of the building is not in a very good condition particularly the second and third floors where water leakage is evident and the impact is visually apparent from the walls (Figure 11).

No significant structural defects apart from the minor surface cracking were observed from the exterior visual inspection. Assessment of building condition from the inside was not carried out as part of this EIA as it is more of an engineering assessment. It is advised that the proponent carries out such an investigation at the noted sites with the consultation of a civil engineer.

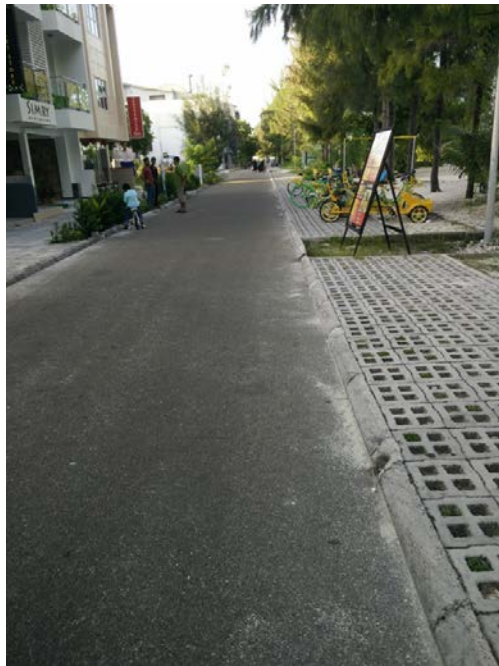




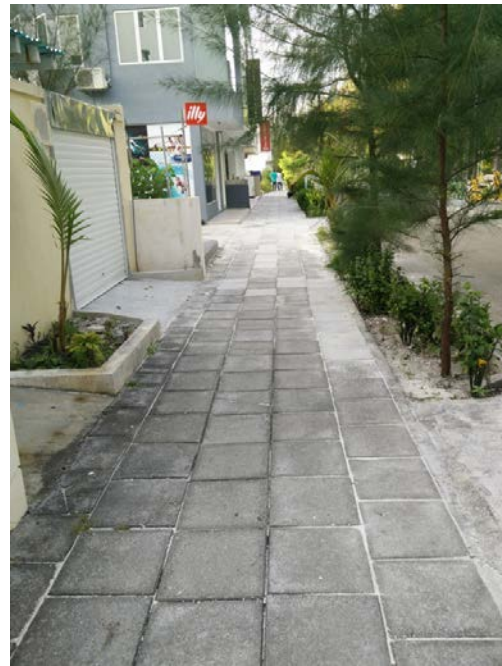
Figure 11: Entrance to the building in lot 10090 at Nirolhumagu (top) back of the building showing the condition of wall and water leakage

7.3.5 Road condition

Road condition of Dhigga magu and adjacent Nirolhumagu 06 Goalhi- and Nirolhumagu 09 Goalhi- Dhigga magu on both sides of the block are in good condition. The pavement and on both sides of the road is wide and in good condition. Road condition is not going to affect the overall structure of the road but the road might get dirty from the construction activities and will be cleaned after the construction work on daily basis.



Dhigga Magu, road and pavement on the seaward side



Pavement buildings ward side

Figure 12: Road condition at the proposed development site.

7.3.6 Vegetation

As this is reclaimed land there is no natural vegetation in the islands. The land plot is covered with various types' of plants (shrubs and creepers) due to human intervention. The dominating low lever bush contains a large number of Ipili pili (*Leucaena leucocephala*) (Figure 13). A medium sized Casuarina plant was found inside the land plot. All these bushes and the Casuarina plant have to be cleared for construction. The removal of bushes, creeper and the Casuarina plant from the project area will be insignificant in terms of environmental impacts.



Figure 13: Vegetation; existing Casuarina plant and some invasive shrubs and creeper covering the ground Lot (A-10079).

7.3.7 Traffic survey

Traffic flow in Dhiggaa Magu is from north to south. The traffic survey on Dhiggaa magu was conducted on two days, an official working day (20th September 2016) and a holiday (Saturday, 1st

October 2016). Both surveys took place on afternoons. The survey included count of vehicles passing in front of the lot in Dhiggaa Magu for half an hour during the survey periods. The survey shows extremely low traffic on Dhiggaa magu. On the first survey the total number of motor cycle count was 15 and the number of cars and trucks 4, no bicycles were encountered. On the second day the number of motor cycles count was 25, cars and truck 5 and two bicycles were counted. Therefore the traffic in Dhiggaa Magu is very low, a car or a motor bike passes the area in every 2 minutes or one and half minute.

Therefore the diversion of traffic during the construction will not cause noticeable inconvenience to be public. The traffic that is coming from north to south can be diverted to Nirolhumagu Golhi 6 and the traffic can enter to Dhiggaa Magu from Nirolhumagu Golhi 9 and continue the ride on Dhiggaa magu (Figure 14). Traffic flow in Nirolhu Goalhi 6 is from E-W and in Nirolhu Goalhi 9 W-E.

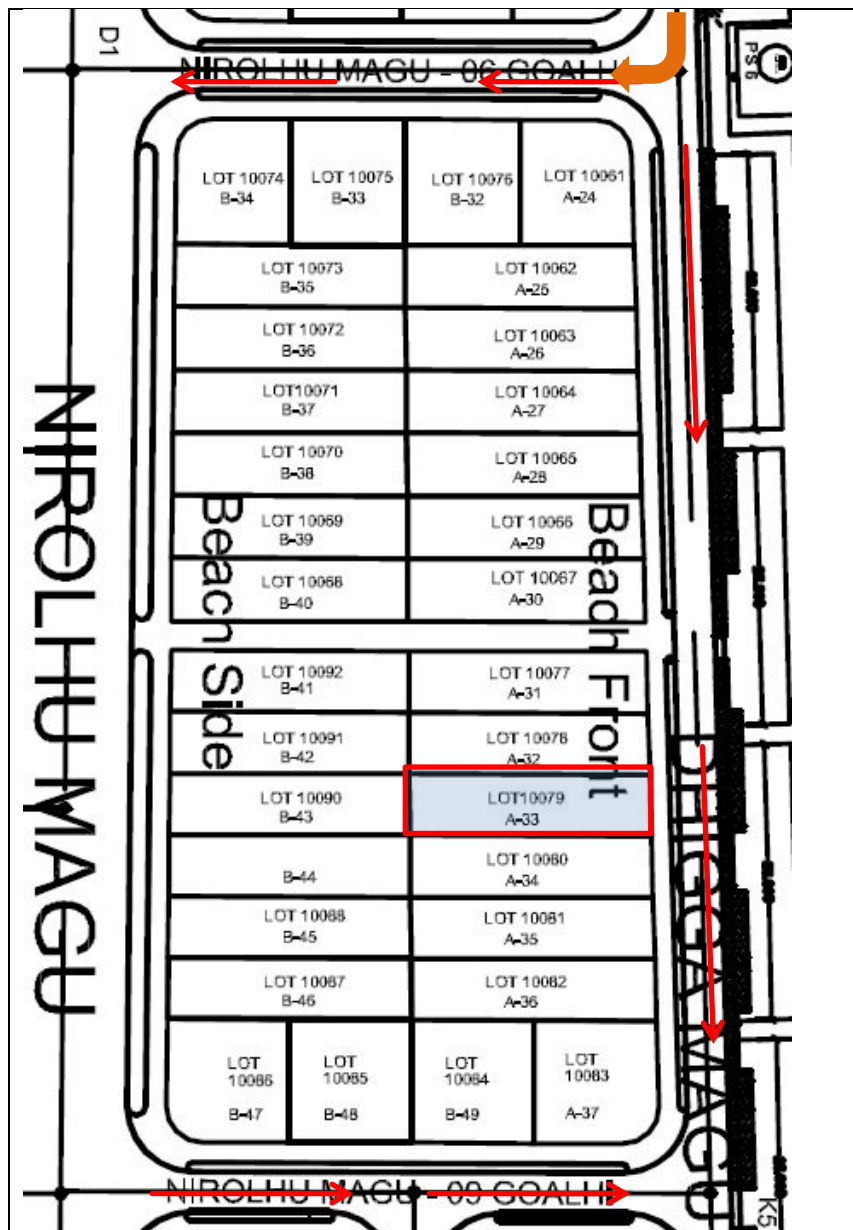


Figure 14: Existing traffic flow direction (red arrow) and traffic diversion during construction hours (Orange arrow)

7.4 SOCIOECONOMIC ENVIRONMENT

The latest population census conducted in 2014 shows that the total population of Malé city is about 155,000 including the over 20 thousand foreigners living in Malé. Hulhumalé is a part of Malé City and is one of the most rapidly urbanizing islands in the Maldives. The pace and development is fueled by the new guesthouse business, targeted for European and Asian holiday makers. High-end service apartment and real estate business is growing rapidly in the island and more are being built.

Hulhumalé is now referred to as the Youth City. It is looked upon as a city of planned developments with modern amenities Hulhumalé plan accommodates wide range of land uses; from commercial and residential to light industrial and institutional uses and so forth (Figure 15). Hulhumalé master plan reflects on the importance of accessibility to green & open spaces to maximize the economic and aesthetic value of Hulhumalé, known as a Green Plan. Also the plan designed to maximize the natural potential of the island as a waterfront oasis known as Blue Plan.

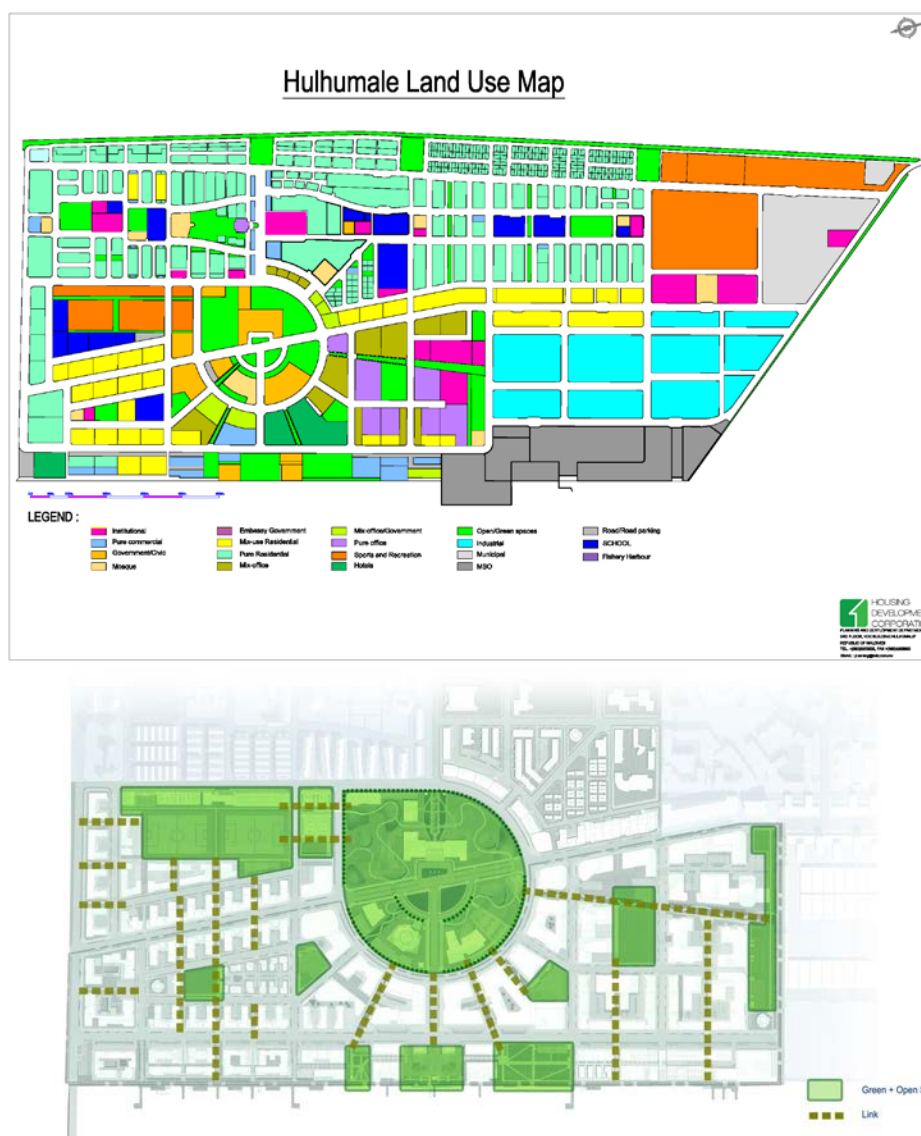


Figure 15: Hulhumalé development master land use plan (top) and Green Plan (bottom) Source: <http://hdc.com.mv/Hulhumalé/land-use/> (Accessed 19th August 2016).

According to HDC the population is around 30000. But with number of new properties coming up and with growing number of guest houses including the daily traffic of coming and goings, the population would be close to over 40,000 or even more. This represents approximately 26% of the total population of the Great Malé Region.

To meet the housing demand and address the many urban problems in Malé, Ministry of Housing and Infrastructure is HDC has expended the land area of Hulhumalé and reclaimed 240 hectares under the 2nd phase of Hulhumalé development project to facilitate to meet the present and future needs of housing in Malé and also provide enough land for commercial and industrial development in great Malé region.

7.4.1 Education

Hulhumalé has two government schools (Grade 1 - 12), an International School and Preschools they are Hulhumalé Preschool, Lale Youth International School, Ghaazhee School and Rehendhi School. Land has been allocated for development of student campus and other facilities for Maldivian National University in Hulhumalé.

7.4.2 Connectivity and Transportation

There is excellent connectivity and transportation service between Hulhumalé, Malé and Ibrahim Nasir International Airport and within Hulhumalé residential and commercial areas.

Ferry service between Malé and Hulhumalé is operated by Maldives Transport and Contracting Company Plc. Ltd and operates daily between 5.30am- 1.30am with ferries every 10-30 minutes leaving both from the Malé and Hulhumalé ferry terminals.

Bus Service: School Bus Service, air-conditioned Public Bus Service and Airport Bus Service are available in Hulhumalé. Also taxi service is available in the island.

Maldives Post Ltd. provides postal services are available in Hulhumalé' seven days a week, and telecommunications services provided by Dhiraagu and Wataniya. Cable TV and internet services are provided by private local companies and Banking services are provided by Bank of Maldives Plc.

7.4.3 Banking

Banking services through the branches of Bank of Maldives and Habib Bank are already available in Hulhumalé. Islamic bank will be scheduled to open its services in Hulhumalé very soon.

7.4.4 Health

The Hulhumalé' hospital is the central health care provider of the island run by the Government. This is 2 storey, 50 bed hospital, with 3 ambulances. It is located within close proximity to the Residential Neighborhood district and strives to eliminate the need to travel to other island hospitals for medical treatment by providing a wide range of medical facilities including minor surgery, obstetrics and gynecology, pediatrics, outpatient clinic rooms a dressing room, a room for immunizations and antenatal checks, an operating theatre, a labour room, and a private pharmacy attached.

7.4.5 Utilities

Utility services are provided by the existing utility service providers in Malé'. Water and sewerage facilities' are managed by Maldives Water and Sewerage Company Ltd. (MWSC) and electricity is provided and managed by the State Electric Company Ltd. (STELCO).

7.4.6 NGOs and association

There are number of registered NGOs and associations operating the Hulhumalé a list of some of the NGOs and associations are provided below:

- ✓ Hulhumalé Association for Women's Improvement
- ✓ Hulhumalé Innovative Youth Association
- ✓ Hulhumalé Environment and Youth Development
- ✓ Hulhumalé Women's Sports
- ✓ Hulhumalé Youth Development Association
- ✓ Hulhumalé Sports Club
- ✓ Hulhumalé Crime Prevention Committee
- ✓ Hulhumalé Development Society

7.4.7 Socio economic impact

Hulhumalé is growing fast with various types of investments and small to large scale commercial activities, local corner shops, guest houses, supermarkets, shopping malls, office complexes, factories, to small cafes, tea shops, convenience stores, and various other commercial outlets that would cater for the needs of the growing population and daily visitors to the island.

Existing supporting infrastructure, transport and other services is a catalyst to attract local entrepreneurs and expatriate community seeking employment and venture into diverse commercial activities in the island. The ongoing developments will facilitate economic growth for greater Malé Region and bring overall economic benefits to the country. The proposed project will create short term employment opportunities particularly for the people living greater Malé region.

8 STAKEHOLDER CONSULTATION

The scoping meeting to determine the scope of the EIA report was held on 7th September 2016 at EPA. During the meeting the stakeholder were identified and the scope of the EIA report was determined.

Methods used for stakeholder consultation include direct communication and interviews with nearby residents around the project, formal meeting such as the scoping meeting and telephone communication with service providers.

8.1 KEY STAKEHOLDER

As per the TOR the key stakeholders identified are

- 1- Hulhumalè Development Cooperation (HDC)
- 2- State Electric Company (STELCO)
- 3- Health Protection Agency (HPA)
- 4- Maldives water and Sewerage Company (MWSC)
- 5- Architects and engineers

8.2 EIA SCOPING MEETING

EIA scoping meeting was held on the 7th of September 2016. Most of the stakeholders apart from MWSC and HPA that is listed in the TOR was present in the meeting (meeting attendance is in Annex 7). The meeting was chaired by Mr. Yazeed Ahmed, Director EPA. The architect gave a briefing on the proposed six storey building with a basement and explained the design details and answered the technical questions. Most of the clarifications and questions were focused on the basement floor and providing necessary utilities and facilities acceptable for human living conditions. The following issues and concerns were raised

- 1- Sewer connection to the existing sewer network in Hulhumalè as the sewerage network system is a gravity system there might be difficulty in directly connecting the basement toilet to the system. (EPA requested to consult with MWSC on this matter and the matter was discussed with MWSC)
- 2- Electricity connection is not an issue as the main connection panel is in the ground floor not in the basement
- 3- Waste management, EPA requested to keep waste disposal bin in a secure and enclosed area within the premises of house as per the EPA regulations. There should be a roof in the area to where the bin is placed to protect it from rain and the bin should have a lid to open and close.
- 4- EPA requested to consult with HPA and HPA was consulted.
- 5- With regard to potential flooding of the basement, the architect explained that the basement is well protected and all the necessary precautions have been considered in the design.
- 6- A separate permission should be obtained from EPA for dewatering

8.3 CONSULTATION WITH MWSC

Stakeholder consultation with MWSC was held on September 19th via telephone conversation with Mr. Mohamed Didi Tel: 3323209. Mr Didi explained that the maximum elevation that can be directly connect with MWSC sewerage network is 2 feet below ground level. If the connection is below that level an extra pump and sump (junction) needs to use. Therefore in the case of the proposed six-storey building the basement where the toilet is below 2 feet from the ground, a sump will be constructed at the level of toilet pipeline and a pump will be used to pump the sewage to the main junction of the

existing sewage network. As per the architect and engineers of the building this has already been considered and they will strictly follow the regulation and guidance from MWSC on this matter.

8.4 CONSULTATION WITH HPA

Health Protection Agency (HPA) was contacted and the engineering drawings of the building were sent via mail to see if they have any concern or suggestion. HPA has checked the drawings and informed by phone (Fathimatha Shabana, Senior Public health programme officer, contact: 3014416) that they have checked the ventilation and safety exist particularly in the basement and it is in compliance with the standards maintained by HPA. They have also stressed to eliminate potential conditions favorable for proliferation of mosquitoes during the construction period.

8.5 1.1 CONSULTATION WITH NEARBY RESIDENTS

Consultation was held with residents nearby the proposed development via direct interviews during the field visit. In general they have no issues as long as the construction is proceeding as per the regulation after obtaining the necessary permissions from the concerned government authorities. They are ready to live and tolerate with the minor inconvenience that will cause during the construction period.

8.6 MAIN CONCLUSIONS FROM THE STAKEHOLDER DISCUSSIONS

Most of the concerns raised during the scoping meeting was addressed and discussed with the relevant authorities and the following are the outcomes of the discussions;

For the proposed six-storey building with the basement, a sump will be constructed at the level of toilet pipeline and a pump will be used to pump the sewage to the main junction of the existing sewage network to dispose wastewater and sewage from the basement toilet.

The main connection panel is in the ground floor not in the basement therefore electricity connection is not an issue as

Waste disposal bins will be located within the boundary in an enclosed area protected from rain and sun and disposed off to the waste management area of Hulhumalè on daily basis.

Necessary permission from EPA and HDC on dewatering, foundation excavation etc will be obtained prior to commencement of construction work.

Nearby residence have no serious issues as long as the construction is proceeds as per the regulation and after obtaining the necessary permissions from the concerned government authorities

List of people met/contacted during scoping meeting and the stakeholder consultation.

Name	Designation	Contact No
Zinaf	Senior urban planner (HDC)	7674221
Nafiz	Senior Municipal Officer (HDC)	7787156
Ibrahim Aslam	Technician (STELCO)	7779886
Amjad Mohamed	Engineer (STELCO)	7783632
Ahmed Thahseen	Architect (SPACE Pvt.Ltd)	7773846
Ahmed Shameem	Proponent's representative	7586586

Fathimath Reema	Director EPA	Fathimath.reema@epa.gov.mv
Yazeed Ahmed	EPA /Director	Yazeed.ahmed@epa.gov.mv
Dr. Mahmood Riyaz	Consultant	7890307
Mohamed Didi	Technician (MWSC)	3323209
Fathuimath Shabana	(HPA)	3014494

9 POTENTIAL IMPACTS AND MITIGATION MEASURES

This section of the report identifies the potential environmental impacts and possible issues that could arise during construction and operational phase of the proposed project. Their identification of potential impacts does not mean that they would necessarily occur or that they could not be successfully mitigated.

Possible impacts arising from the construction and operation works are categorized into reversible and irreversible impacts. Reversible and irreversible impacts are further categorized by intensity of impacts (negligible, minor, moderate and major) for identifying best possible remedial (mitigation measures) action to be taken. Below are the impact categories

- Negligible: the impact is too small to be of any significance (Reversible)
- Minor: the impact is undesirable but accepted (Reversible)
- Moderate: the impact give rise to some concern but is likely to be tolerable in short-term, or will require value judgment as to its acceptability (May or may not be Reversible)
- Major: the impact is large scale giving rise to great concern; it should be considered unacceptable and requires significant change or halting of the project (Irreversible)

Severity of impact is assessed by reviewing the engineering design, detailed site plan as well as comparison of development with the existing environment and construction methodologies employed. Mitigation measures are derived based on the site specific assessment as well as similar project elsewhere in the Maldives. Impact identification matrix is provided in Table 6. Potential impacts and their mitigation measures and detail discussion is the following sections. Table 7 gives a summary of impacts their magnitude reversibility and duration.

9.1 IMPACT IDENTIFICATION

The following section describes in detail and discusses the main potential environmental impacts that have been identified and predicted for the proposed construction of six storey building with a basement in Hulhumalè Plot A-10079. Identified potential impacts are divided into construction phase and operation phase environmental impacts.

9.2 LIMITATION/UNCERTAINTY OF IMPACT PREDICTION

The methods used to predict and evaluate the environmental impacts that may be associated with the proposed construction of six storey building with a basement in Hulhumalè Plot A-10079 may not be the most comprehensive. The main shortcoming of these methods is that impacts are predicted by reviewing the survey data collected during the field visits and information revealed by the designers and engineers, therefore the assumptions have been made to predict the impacts which may or may not be accurate. Also, the data collected during the field visit is limited, which subsequently limits the overall understanding of even the short term environmental conditions (wave condition, currents, and littoral movement). Nonetheless, within the time limitation of EIA field data collection and report preparation the methods used are concise and provide a general overview as well as the range of impacts that can affect the environment. Given that there may be uncertainties in terms of structural failures of neighbouring structures as well as potential claims of damage or nuisances such as availability of groundwater during the dewatering period, it is important to undertake monitoring as described in the monitoring programme given in this EIA report.

Table 6: Impact identification matrix

Impact	Construction phase Activities						Operational Phase		
	Site setup and Fencing	Work force	Excavation and earthwork	Dewatering	Concrete work and finishing of the building	Demobilization	Use of building	Waste and wastewater disposal	Power and water consumption
Noise	-	-	-	X	-	-	-	-	-
Dusting -Air Quality and vibration	-	X	-	X	-	-	X	-	-
Built environment	-	X	-	-	-	-	X	X	X
Terrestrial fauna and Flora	X	X	X	X	X	X	X	X	X
Ground water	X	X	-	-	-	X	X	X	X
Soil	-	X	-	-	-	-	X	X	X
Health and safety	X	-	-	X	-	X	X	-	+
Socio-economic	+	+	-	X	+	-	+	X	+

Key: (-) Negative impact (+) Positive impact (X) no impact

9.3 IMPACTS AND MITIGATION MEASURES

Construction phase can be considered as the period in any developmental project that causes major direct and indirect long and short-term impacts on the environment. Anticipated potential direct and indirect environmental impacts from the proposed construction of six storey building with a basement in Hulhumalè Plot A10079 include the following:

- Mobilization of Equipment and Labour
- Noise, Vibrations and Air Pollution
- Excavation earthwork and leveling
- Dewatering and ground water quality
- Soil erosion
- Construction waste
- Road traffic

The following paragraphs will provide detailed impacts and mitigation measures during the construction phase of the project.

9.3.1 Impacts from Mobilization of Equipment and Labour

Mobilization of excavator and concrete machine and other equipment and machinery needed for the project during the construction phase will have minor impact on the environment. The major impact

of the mobilization would be aesthetic unattractiveness of the vehicles and equipment on site. Operation of the equipment and vehicles will increase the ambient noise levels, emission of CO₂ and increase in dust particles that will be carried to a distance from the construction site. Noise and dust pollution may have health implications to the people living nearby areas.

Impacts: All sorts of motorized equipment, requiring fuel, lubrication and maintenance will be used on the site. Many will be fitted with lead batteries. Therefore the potential accidental spillage and contamination of the soil and the sea by hydrocarbons as well as the careless disposal of batteries exists during the construction period.

9.3.2 Noise, Vibrations and Air Pollution

During the mobilisation of equipment and operation of heavy machinery for construction work, it is anticipated that significant noise will be generated. Minor ground vibration is anticipated during movement of excavators and heavy vehicles. Dust and emissions from vehicle and machinery exhausts will degrade the air quality. However, these impacts will be short term and can be mitigated to avoid nuisance to the nearby residents. With proper mitigation measures, it is unlikely that noise, vibration and air pollution impacts will cause long term effects such as human health risks leading to increased public and private health costs.

9.3.3 Excavation earthwork and levelling

Excavation will be undertaken for laying the concrete foundation. The footprint of the building is 137.5m². The area will be excavated up to a depth of 2.3 m resulting in 316.25 cbm of soil from the land plot. The earth material excavated will be used for back filling and the rest will be disposed to a site instructed and approved by HDC.

Technically excavation causes unloading and reloading of subsoil and the intensity of these impacts depends on subsoil characteristic and excavation geometry (depth, width and length). Hence, the unloading effect for small excavations such as the proposed project has negligible influence on displacements. Structural impacts to the nearby buildings and roads are highly unlikely; however, it has been identified as having potential implications, if not undertaken carefully.

9.3.4 Dewatering and ground water quality

Surface run off of polluted water with suspended impurities (sand cement and other construction material mixed with water) may seep into the ground water and contaminate the ground water aquifer. Substantial quantities of water would be used in the construction activities. Concrete mixing will be undertaken within the project premises except during casting of slabs and foundation.

Dewatering from the proposed development is roughly estimated to be 137,000 litre. Impact of dewatering on groundwater table will be short-term in nature, including loss of groundwater from the project boundary and vicinity. Major impact of dewatering would be increased salinity of ground water within the vicinity areas for a short period of time. Considering the fact that most of the households nowadays are using piped water for daily household uses, there will be no direct impact to the households from increased salinity but the impact would be felt for the trees nearby the site.

9.3.5 Soil erosion

Soil erosion due to rainwater runoff is often areas excavated to lay the building foundations. Excavated areas during the rainy season will be exposed and rainwater runoff may carry the

sand which in turn will weaken the soil and may cause water saturation. Therefore, it would be necessary to plan foundation works in dry season or in a way that will minimize the exposure of excavated area to rain.

Soil erosion will weaken the structures standing on them. In extreme flood events excavated areas will exacerbate the potential to extensive damage or collapse the adjacent building.

9.3.6 Construction waste

Solid waste stream of a construction project will include a mixture of packaging waste such as cement bags and cardboards, concrete waste, iron, timber, gypsum boards, aluminum, nets, wire, glass, plastic etc that are generated from construction activities. The waste material generated during construction phase needs to be appropriately disposed. If not properly disposed off aesthetic conditions of the surrounding environment will be degraded in addition to health risks, dust odor and smell nuisance to nearby residents. Hazardous waste such as waste oil and lubricants if not disposed properly it will contaminate and pollute the groundwater.

Material storage in the construction sites should be in a way that does not cause any hindrance to local movement and daily routine of the workforce within the site. Stockpiles of construction material has to be properly covered to protect from rain, dust, heat and erosion.

It would be necessary for the contractor transport the construction waste in vehicle licensed to transport waste and dispose to designated site allocated by HDC for the disposal of construction waste in the waste management site in Hulhumalè.

9.3.7 Road traffic

Vehicular and pedestrian movements during loading and unloading of materials to site, especially during the concrete works will disturb the road traffic in Dhigaa Magu. At present, vehicular movement in the project is low therefore it will have a negligible impact on the traffic flow in the area.

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9.4 POTENTIAL POSITIVE IMPACTS

Potential positive impact of the project would be creation of short term employment opportunities for the locals. It is also believed that there will be several opportunities for locals including direct or indirect employment and provision of goods and services during the project implementation.

The project will also contribute to improvement in living condition, minimization of congestion and improved aesthetics and modernization of the built environment.

The project will increase the value of the land/project site, improve the living environment and provide economic opportunities and contribute directly and indirectly to health and wellbeing. These are considered as important positive impact of the project.

9.5 NEGATIVE IMPACTS

- 1- Loss of existing vegetation on the site (negligible impact).
- 2- Short-term increase in ambient noise level, dust and vibration negligible disturbance to the road traffic.
- 3- Impaired visual impacts from the presence of the construction equipment and site.
- 4- Potential short term increase in salinity of ground water aquifer due to dewatering
- 5- Increase in electricity demand but no need to increase the existing capacity of the diesel generators in Hulhumalè

9.6 CUMMULATIVE IMPACTS

Land plots in the block where the A-10079 is located is already constructed except the few Lots at the north eastern end of the block. As mentioned earlier the proposed construction Lot is surrounded by already constructed buildings. Therefore, it is very unlikely environmental impacts from development construction activities will be compounded during the construction period. Therefore the magnitude of impacts such as dust and noise emission and increased traffic congestion etc is unlikely to go beyond what has been described in this report in this area on a collective basis.

9.7 IMPACT MITIGATION MEASURES

Table 6 below lists of significant impacts identified above in Section 10 and describes the corresponding mitigation measures that should be put in place during implementation of the proposed construction of six storey building with a basement at Hulhumalè Plot A10079. In summary the impact mitigation measures proposed should entail:

- 1) Mitigation measures for dewatering and foundation excavation include the following:
 - To minimise prolonged exposure of soil erosion dewatering operations will be very rapid
 - Dewatering permission will be obtained from EPA and approved dewatering related signboards will be kept on site.
 - Excavations shall conform to the lines, grades, side slopes and levels shown in the drawings or as directed by the engineer.
 - Excavation shall be taken in the presence of the engineer or competent supervising personnel.
- 2) Dust and noise related mitigation measures
 - Regular spray with water on stockpiles of fine aggregate, sand and construction material on site to prevent fugitive emissions.
 - Transport material to the site in a covered vehicle to avoid spillage of materials.
 - All roads need to be kept clear of dust and other extraneous materials dropped by material transport vehicles.
 - Loading and unloading to the site shall be done only during day time.
 - Avoid noisy operations at night.
- 3) Proposed safety practices during construction are:
 - Standard construction safety procedures shall be strictly followed such as Fencing, warnings, signs demarcating unsafe areas hard hat areas, shoes etc.
 - safety nets should be used to cover buildings to prevent injury to public.
 - Safety paths should be identified for public movements.

- Provide first aid kits in case of an emergency and follow safety protocols during such event.
- Provide necessary safety appliances such as protective footwear, cloth gloves, safety goggles for welders, helmets, masks, etc. to the workers and staff.
- Safety signs shall be installed during construction.

4) Solid waste management

- Construction waste in allocated location are segregated and collected based on waste types
- Reuse material from construction waste where ever possible
- Daily transportation of unusable construction waste to the waste collection yard in Hulhumalè in an EPA licenced vehicle
- During the project activities and operational phases, all efforts should be made to prevent the intentional or accidental spill of oil, waste oil and hazardous materials release into the environment which could lead to further damage to the environment.
- Contractor should take steps to ensure that there is no dumping of oily waste from vehicles and equipment activities related to the project.
- Careful consideration should be given to the requirements for storage and appropriate disposal of waste oil.

9.7.1 Mitigation Cost Elements

The mitigation measures associated with significant costs, beyond those included in construction cost, and good mitigation practice, is identified below in Table 14 along with the major cost elements. Costs are based on the estimation of the magnitude activity.

Table 7: Significant impacts, mitigation measures and associated costs

ACTIVITY	IMPACTS	IMPACT PREDICTION			MITIGATION MESURES	Mitigation				
		Magnitude	Reversibility	Duration		cost (MVR)	Benefit	Expertise	Responsibility / Manpower	Equipment /technology timing
1. Dewatering	Loss of benthic biota increased salinity of ground water	M	R	S	Short period, obtain necessary approval from EPA , presence of a competent supervisor , Excavations shall conform drawings	Included in the project	Reduce desalination and potential flooding	Environmental protection	Contractor 1-2	Contractor/ pump/ pre construction
2- Excavation concrete work transportation etc	Dust and noise	L	I	M	Regular spray with water on stockpiles of fine aggregate	500 pipe to spray water	Reduce dust and noise	Environmental protection public health and safety	Contractor / 1	Contractor / Construction Phase
					Transport material to the site in a covered vehicle to avoid spillage of materials, keep road clear at all times					
					Loading and unloading only daytime					
					No noisy operations at night					
Construction work	Workers and public Safety	M	R	S	Standard construction safety procedures fencing, warnings, signs demarcating unsafe areas hard hat areas, shoes etc.	Included in the project	Ensure safety of workers and public	Environment and public health and safety	Contractor /0	Contractor/ Construction phase
					Safety nets to cover buildings to prevent injury to public. Safety paths should be identified for public movements, First aid kits, safety appliances and safety signs installed					
Solid waste management	Construction waste	H	R	M	Construction waste segregated and collected based on waste types Reuse material from construction waste Daily transportation of unusable construction waste to the	Included in the project	Reduce solid waste	Environmental protection	Contractor /1	Contractor/ Construction phase

					waste collection yard in Hulhumalè , no dumping of oily waste, storage of disposal properly					
	Household waste Operational phase	L	R	M	Provide enclosed area to keep the waste bins protected from rain and sun. Ensure that household waste is properly collection and transported to Hulhumalè yard	400- 500MVR/ month	Properly manage waste	Environmen tal Protection	Resident/1	Resident/ dust bins with lids/ Operational phase

Key

Magnitude

H=High

M=Medium

L=Low

Reversibility

I=Reversible

R=Reversible

Duration

L= Long Term (Over 10 years)

M=Medium term (Over 5 years)

S=Short term (Below 5 years)

10 ALTERNATIVES

10.1 NO DEVELOPMENT OPTION

It is believed that minor environmental impacts may be generated from the proposed construction of six storey building with a basement in Hulhumalè Lot A10079. Although no impacts on the environment will be associated if the proposed development does not go ahead, the development will bring numerous socio-economic and contribute to improvement in living condition, minimization of congestion and improved aesthetics and modernization of the built environment. The project will increase the value of the land/project site, improve the living environment and provide economic opportunities and contribute directly and indirectly to health and wellbeing.

Given the range of benefits that the proposed development will bring the project has been considered important and “No-Development” Option has been considered not favourable for the proposed development and decided to go ahead with the proposed development.

Development can take place only within the limits of the environment and the society. Hence, the aim is to ensure that all project activities are undertaken without any adverse long term irreversible environmental damages that cannot be mitigated. Preferred alternatives discussed below has been selected based on the above broad development concept.

10.2 DEVELOPMENT OPTION

Having decided and followed the development option of the proposed project one has to consider the alternative options for the proposed six-storey building with a basement in Hulhumalè Lot A10079 that would have least environment impact. Following have been considered for the alternatives.

10.3 ALTERNATIVE POWER SOURCE

The present proposal involves use of power from the existing utility services in Hulhumalè. Operation of the will be additional increase in electricity demand but no need to increase the existing capacity of the diesel generators in Hulhumalè. It is recommended to consider solar energy to especially given the large empty terrace. Solar energy can supplement to the electricity use and bring substantial savings on energy expenses.

10.4 ALTERNATIVE FOUNDATION

A pile foundation can be considered as an alternative foundation method which will provide structural stability to the building. But generally Pile foundations are used for larger buildings with more than 10 floors. The building being small and of only six storeys pile foundation may not be ideal for this development. Therefore shallow raft foundation is the most suitable type of foundation for the proposed development.

11 MONITORING

Environmental monitoring is essential to ensure that mainly constructional impacts are known and eliminated in a timely manner. Dealing with impacts earlier would save money and also help planning and operationalize the process.

The parameters that are most relevant for monitoring the impacts that may arise from the proposed project are included in the monitoring plan. These include ground water (pH, dissolved oxygen, electrical conductivity, and faecal coliforms).

Monitoring by experienced civil engineers during foundation excavation is extremely important to ensure that on hand expertise to protect the foundations of the adjacent buildings and attend any emergencies in a timely manner. Also the dewater process should only be carried out in the presence of an experienced civil engineer to ensure that the process does not impact the foundations of adjacent buildings.

Waste management process during the construction and operational phase of the project should be monitored to ensure that the impacts due to waste generated is properly managed and also ensure that there is no leakage of hazardous material during use or storage prior to disposal.

The main objectives of the monitoring plan are:

- To identify whether the predicted impacts are accurate and mitigation measures taken are effective
- To identify any unforeseen impacts so that appropriate mitigation measures can be taken at the earliest
- To identify and resolve any issues of social unrest at the earliest
- To eliminate or reduce environmental costs

Table 8: monitoring schedule

Type	Parameters	Locations	Frequency	Estimated cost (USD)
Water quality monitoring / sampling and testing from a laboratory	Salinity Hydrocarbons Sulphates TDS Total Coliform and faecal coliform	Take water samples from the neighbourhood and the construction site	During construction	400/ set of tests
Monitoring of foundation and structural integrity of adjacent buildings to the Lot A10079.	Structural elements , Keeping records of complaints by nearby residents in the case of damages.	Adjacent buildings to the Lot A10079	daily during excavation and dewatering periods by a civil engineers	Already in the project
Dewatering impacts	Start time and end time of	Monitoring of groundwater wells	daily during excavation and dewatering	Already included

	dewatering and measuring water levels	of adjacent household	periods by a civil engineers	in the project
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11.1 MONITORING COSTS AND COMMITMENT

It is understood that costs of monitoring be borne by the proponent. It is also understood the mitigation measures would be accommodated in the contract costs. A commitment letter confirming compliance on mitigation measures is given in Annex 5.

11.2 MONITORING REPORT

A detailed environmental monitoring report is required to be compiled and submitted to the Environment Protection Agency annually, based on the data collected for monitoring the parameters included in the monitoring programme given in this report.

The report will include details of the site, strategy of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed.

11.3 REPORTING SCHEDULE

During the construction phase monitoring report will be submitted every six months. And during the operational phase annual monitoring report will be submitted for two years.

12 CONCLUSIONS

The environmental impact assessment study for construction of six-storey building with a basement in Hulhumalè Lot A-10079 found that there are two main activities that would cause significant negative environmental impacts. Those, in order of significance, are:

1. Foundation excavation and dewatering.
2. Construction and operational waste

Of these a long term impact would be from constructional waste. The waste material generated during construction phase needs to be appropriately disposed if not aesthetic conditions of the surrounding environment will be degraded in addition to health risks, dust odour and smell nuisance to nearby residents is anticipated. Hazardous waste such as waste oil and lubricants if not disposed properly it will contaminate and pollute the groundwater. These impacts would be cumulative and can be managed through proper monitoring and addressing them in a timely manner. Based on the scale of the construction projects that is taking place in Maldives at the time of this writing, impacts associated with this project activity is insignificant.

Impact of dewatering on groundwater table will be short-term in nature, including loss of groundwater from the project boundary and vicinity. Major impact of dewatering would be increased salinity of ground water within the vicinity areas for a short period of time. Considering the fact that most of the households nowadays are using piped water for daily house hold uses, there will be no direct impact to the households from increased salinity but the impact would be felt for the trees nearby the site.

The study has evaluated alternative options for the project activities and evaluated potential option for power generation and alternative foundation options. Even though there is no very significant impact from this project after the report has come-up with an extensive monitoring programme that will keep on monitoring environmental changes associated with the project and make necessary adjustment based on the findings of various measured environmental parameters suggested in the monitoring plan.

The study found that the proposed project is in line with key legal and policies maintained by the Ministry of Housing and Infrastructure and EPA including Environmental Protection and Preservation Act, EIA Regulations, Hulhumalè Planning Guidelines and Maldives National Building Code.

Therefore on the basis of this environmental impact assessment study and the impact mitigation measures proposed in the report will be duly implemented and recommendations are given due consideration, it is concluded that the benefits of the proposed construction of six storey building with a basement is Hulhumalè Plot A10079 will substantially outweigh its imposition on the environment.

13 REFERENCES

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14 ANNEXES

Annex 1: EIA Terms of Reference (ToR) Approved by EPA

Annex 2: Design approval

Annex 3: Structural design schedule

Annex 4a- 4e: Floor plans and building design schedules and details

Annex 5: Commitment letter from the proponent

Annex 6: Water sample analysis report

Annex 7: Scoping meeting attendance list

Baseline data will be collected before construction and from at least two bench marks

All data must be collected as per the requirement of the EPA data collection guideline published on www.epa.gov.mv. All survey locations shall be referenced with Geographic Positioning system (GPS) including water sampling points etc. Information should be divided into the categories shown below:

Physical and Biological

- Ambient noise level in the vicinity of the site
- Traffic flows (Size and direction) around the project site
- Vegetation cover in the project site
- Ground water quality for physical parameters

Structural environment

- State of the adjacent buildings including photographic records of existing damages as baseline reference;
- Road condition in the surroundings
- Existing structures/uses of the proposed site

Socioeconomic environment

- Demographic data for Hulhumale population
- Brief description of social environment of Hulhumalé in General and adjacent residential units in particular
- Traffic condition near the project site

Hazard vulnerability:

- Vulnerability of area to flooding.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Legal requirements:

Task 4. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages – The EIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment

- Loss of vegetation if any
- Impacts on terrestrial Fauna from earthworks
- Impacts on ground water table and quality as a result of dewatering;
- Impact on landscape integrity/scenery

Impact on the socio economic environment

- Impact on employment and income such as job opportunities in the construction and operational phase;
- Disturbance to resident and cultural facilities/activities
- Impact on transportation/ traffic

Construction related hazards and risk

- Dust and emission
- Impacts due to foundation work
- Risk of accidents to workers
- General public health and safety issues

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 5. Alternatives to proposed project – Describe alternatives including the “no action option” should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the “no action alternative”. This should include but not limited to alternative design,

alternative equipment/machinery for construction, alternative disposal sites and alternative containment measures. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

Task 6. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 7. Development of monitoring plan (see appendix)– Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan during and after completion of the proposed project. Reporting requirement shall be outlined. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, cost commitment from the proponent to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided.

Task 8. Stakeholder consultation,– Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders, government authorities, engineers/designers, HPA and MWSC. The EIA report should include a list of people/groups consulted, their contact details and summary of the major outcomes.

Presentation- The environmental impact assessment report, to be presented in digital format, will be concise and focus on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations for any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012

Timeframe for submitting the EIA report – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

18th September 2016



THE CERTIFICATE

For structural design compliance - category A1

1. I **Abdulla Rameez** being a registered accredited professional, hereby certifies that I have in accordance with this National Building Professionals Accreditation Regulation set out by the Registrar, have carried out an evaluation, analysis and review of the plans of the building works attached and to the best of my knowledge and belief the plans do not show any inadequacy in the key structural elements of the building to be erected or by the works carried out in accordance with those plans.
2. In arriving at my conclusion , I confirm that I have reviewed and evaluated the design in accordance with the building regulations using the following criteria:-
 - a. codes of practice adopted in the design;
 - b. including wind load, construction load or dynamic load, if applicable) checked;
 - c. standards and specifications of structural elements;
 - d. structural design concept and identification of the key structural elements;
 - e. structural analysis and design of all key structural elements including foundation systems;
 - f. stability of structural frame;
 - g. structural detailing;
 - h. others specify.....


Plot Name/No: Hulhumale lot 10079

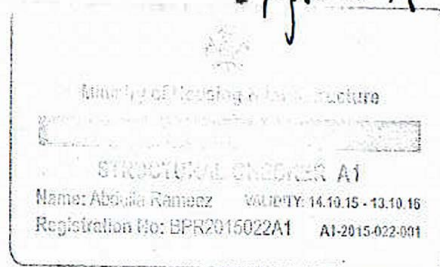
Date: 17th June 2016

Type of Building: Residential building


NBPAR Number: BPR2015022A1

Plot Owner's Name: Mrs. Maana Rafiu

A.P. Engineer's Signature: 



FOR OFFICIAL USE ONLY

Building Permit No.: <i>HDC(161)-M/R/2016/103</i>	Local Authority's Stamp 
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HOUSING
DEVELOPMENT
CORPORATION LTD

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110

ST. DESIGN BY : ABDULLA RAMEEZ

PROJECT: LOT 10079

LICENCE NO : BDR2016038E

BEAM NO: B1

JOB NO : _____ **DATE :** 28/4/2016

1. Beam Properties:

Beam Type: T

h = 400 mm

Cover = 35 mm

b = 130 mm

d = 353 mm

L = 1.60 m

A Supported = 1.00 m²

2. Material Properties:

fcu = 25 N/mm²

fy = 415 N/mm²

fyy = 250 N/mm²

gc = 1.5

gs = 1.05

3. Beam loading

Dead load 'Gk = 16.88 kN

Live load 'Qk = 1.5 kN/m²

Point Load =	a	b
KN	0.00 m	.00 m

Ultimate load, n = 1.4Gk + 1.6Qk

Ultimate load 'n = 16.27 kN/m

Dead Load

Self - Weight of Wall = 7.02 KN/m


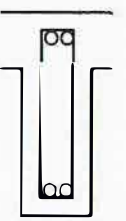
Self - Weight of Beam = 0.80 KN/m

Self - Weight of Slab = 3.48 KN/m²

Finishes = 0.75 KN/m²

Ceiling & M&E = 0.15 KN/m²

4. Beam Design

<p>Critical Positive Moment @ Mid-Span M₊ = 3.79 KNm</p> <p>K = 0.009 < K' = 0.156 < K' , Section is Singly Reinforced !</p> <p>z = 335 mm</p> <p>As req = 29 mm²</p> <p>Bar No @ BOTTOM = 2 NO of Layer : 1</p> <table style="width: 100%;"> <tr> <td>(B1) 2</td> <td>T12</td> <td>226</td> <td></td> </tr> <tr> <td>(B2) 0</td> <td>T</td> <td>0</td> <td></td> </tr> <tr> <td>(B3) 0</td> <td>T</td> <td>0</td> <td></td> </tr> </table> <p>As pro = 226 mm²</p> <p>As min = 68 mm² OK !</p> <p>As req = 29 mm²</p> <p>As Pro = 226 mm² OK !</p> <div style="text-align: center;">  <p>MID - SPAN</p> </div>	(B1) 2	T12	226		(B2) 0	T	0		(B3) 0	T	0		<p>Cl:3.4.4.4</p>
(B1) 2	T12	226											
(B2) 0	T	0											
(B3) 0	T	0											
<p>Maximum Negative Moment @Support M₋ = 4.39 KNm</p> <p>K = 0.011 < K' = 0.156 < K' , Section is Singly Reinforced !</p> <p>z = 335.4 mm</p> <p>As req = 33 mm²</p> <p>Bar No @ TOP = 2 NO of Layer : 1</p> <table style="width: 100%;"> <tr> <td>(T1) 2</td> <td>T12</td> <td>226</td> <td></td> </tr> <tr> <td>(T2) 0</td> <td>T</td> <td>0</td> <td></td> </tr> <tr> <td>(T3) 0</td> <td>T</td> <td>0</td> <td></td> </tr> </table> <p>As pro = 226 mm²</p> <p>As min = 68 mm² OK !</p> <p>As req = 33 mm²</p> <p>As Pro = 226 mm² OK !</p> <div style="text-align: center;">  <p>SUPPORT</p> </div>	(T1) 2	T12	226		(T2) 0	T	0		(T3) 0	T	0		<p>Cl:3.4.4.4</p>
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(T2) 0	T	0											
(T3) 0	T	0											

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110
 PROJECT: LOT 10079
 BEAM NO: B1

ST. DESIGN BY : ABDULLA RAMEEZ
 LICENCE NO : BDR2016038E
 JOB NO : _____ DATE : 28/4/2016

5. Beam shear

Maximum shear Force: V* = 15.0 kN						Cl:3.4.5.3 Table:3.7
Main Steel		Link	Legs	Side cover	Shear V	
2	T12	R6	2	35	15.0	
0	T					
no	mm Ø	mm Ø	1NOS	mm	kN	
As =	226 mm ²	% =	0.493	< 3 OK !		
v =	0.326 N/mm ²	400/d =	1.133	> 1 OK !		
v _c =	0.515 N/mm ²	(v _c + 0.4) =	0.915	> v DesignLinks required !		
(v - v _c)bv =	52.00 N/mm					
V max =	4.00 N/mm ²			v < v max! Beam Dimensions OK !		
Asv =	56.55 mm ²					
Sv =	258.28 mm					
Provide ! 1 NO R Ø 6mm @ 250 c/c				Link spacing is OK !		

6. Beam Deflection

M/bd ² =	0.23			Table:3.9
f _s =	35.04			
MFT =	2.00	< 2	OK !	
Basic (Span/d) ratio =	20			
Allow (Span/d) ratio =				
Actual (Span/d) ratio =	4.53		OK !	

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110 ST. DESIGN BY : ABDULLA RAMEEZ
 PROJECT: LOT 10079 LICENCE NO : BDR2016038E
 BEAM NO: B2 JOB NO : _____ DATE : 28/4/2016

1. Beam Properties:

Beam Type: T
 h = 400 mm Cover = 35 mm
 b = 200 mm d = 353 mm
 L = 3.78 m
 A Supported = 3.57 m²

2. Material Properties:

fcu = 25 N/mm²
 fy = 415 N/mm²
 fyy = 250 N/mm²
 gc = 1.5
 gs = 1.05

3. Beam loading

Dead load 'Gk = 46.80 kN
 Live load 'Qk = 1.5 kN/m²

Point Load =	a	b
KN	0.00 m	.00 m

Ultimate load, n = 1.4Gk + 1.6Qk
 Ultimate load 'n = 19.60 kN/m

Dead Load

Self - Weight of Wall = 7.02 KN/m
 Self - Weight of Beam = 1.22 KN/m
 Self - Weight of Slab = 3.48 KN/m²
 Finishes = 0.75 KN/m²
 Ceiling & M&E = 0.15 KN/m²

4. Beam Design

<p>Critical Positive Moment @ Mid-Span M_{max} = 25.46 KNm K = 0.041 < K' = 0.156 < K' , Section is Singly Reinforced ! z = 335 mm As req = 193 mm² Bar No @ BOTTOM = 2 NO of Layer : 1 (B1) 2 T12 226 (B2) 0 T 0 (B3) 0 T 0 As pro = 226 mm² As min = 104 mm² OK ! As req = 193 mm² As Pro = 226 mm² OK !</p>	<p>MID - SPAN</p>	Cl:3.4.4.4
<p>Maximum Negative Moment @Support M_{max} = 29.48 KNm K = 0.047 < K' = 0.156 < K' , Section is Singly Reinforced ! z = 333.3 mm As req = 224 mm² Bar No @ TOP = 2 NO of Layer : 1 (T1) 2 T12 226 (T2) 0 T 0 (T3) 0 T 0 As pro = 226 mm² As min = 104 mm² OK ! As req = 224 mm² As Pro = 226 mm² OK !</p>	<p>SUPPORT</p>	Cl:3.4.4.4

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110 ST. DESIGN BY : ABDULLA RAMEEZ
 PROJECT: LOT 10079 LICENCE NO : BDR2016038E
 BEAM NO: B2 JOB NO : DATE : 28/4/2016

5. Beam shear

Maximum shear Force: $V^* = 42.6$ kN						
Main Steel		Link	Legs	Side cover	Shear V	
2	T12	R6	2	35	42.6	
0	T					
no	mm \emptyset	mm \emptyset	1NOS	mm	kN	
As =	226 mm ²	% =	0.320	< 3 OK!		Cl:3.4.5.3 Table:3.7
v =	0.603 N/mm ²	400/d =	1.133	> 1 OK!		
v _c =	0.446 N/mm ²	(v _c + 0.4) =	0.846	> v Design Links required!		
(v - v _c)bv =	80.00 N/mm					
V max =	4.00 N/mm ²	v < v max! Beam Dimensions OK!				
Asv =	56.55 mm ²					
Sv =	167.88 mm					
Provide! 1 NO R \emptyset 6mm @ 150 c/c						Link spacing is OK!

6. Beam Deflection

M/bd ² =	1.02			Table:3.9
f _s =	235.53			
MFT =	1.52	< 2	OK!	
Basic (Span/d) ratio =	26			
Allow (Span/d) ratio =	39.42			
Actual (Span/d) ratio =	10.71		OK!	

1. Beam Properties:

Beam Type: T
 h = 450 mm Cover = 35 mm
 b = 200 mm d = 377 mm
 L = 6.03 m
 A Supported = 7.90 m²

2. Material Properties:

f_{cu} = 25 N/mm²
 f_y = 415 N/mm²
 f_{yy} = 250 N/mm²
 g_c = 1.5
 g_s = 1.05

3. Beam loading

Dead load 'Gk' = 85.75 kN
 Live load 'Qk' = 2 kN/m²

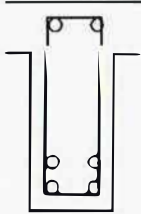
Point Load =	a	b
KN	0.00 m	0.00 m

Ultimate load, n = 1.4Gk + 1.6Qk
 Ultimate load 'n' = 24.11 kN/m

Dead Load

Self - Weight of Wall = 7.02 kN/m
 Self - Weight of Beam = 1.46 kN/m
 Self - Weight of Slab = 3.48 kN/m²
 Finishes = 0.75 kN/m²
 Ceiling & M&E = 0.15 kN/m²

4. Beam Design

<p>Critical Positive Moment @ Mid-Span M₊ = 125.17 kNm</p> <p>K = 0.176 < K' = 0.156 >K' compression steel required !</p> <p>z = 293 mm</p> <p>As req = 1084 mm²</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Bar No @ BOTTOM = 4</td> <td style="width: 30%;">NO of Layer : 2</td> <td style="width: 40%;"></td> </tr> <tr> <td>(B1) 2 T20</td> <td>628</td> <td></td> </tr> <tr> <td>(B2) 2 T20</td> <td>628</td> <td></td> </tr> <tr> <td>(B3) 0 T</td> <td>0</td> <td></td> </tr> </table> <p>As pro = 1257 mm² As min = 117 mm² OK ! As req = 1084 mm² As Pro = 1257 mm² OK !</p> <div style="text-align: center; margin-top: 10px;">  </div> <p style="text-align: center;">MID - SPAN</p>	Bar No @ BOTTOM = 4	NO of Layer : 2		(B1) 2 T20	628		(B2) 2 T20	628		(B3) 0 T	0		<p>Cl:3.4.4.4</p>
Bar No @ BOTTOM = 4	NO of Layer : 2												
(B1) 2 T20	628												
(B2) 2 T20	628												
(B3) 0 T	0												

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110
 PROJECT: LOT 10079
 BEAM NO: B3

ST. DESIGN BY : ABDULLA RAMEEZ
 LICENCE NO : BDR2016038E
 JOB NO : _____ DATE : 28/4/2016

5. Beam shear

Maximum shear Force: V*= 83.6 kN						Cl:3.4.5.3 Table:3.7
Main Steel		Link	Legs	Side cover	Shear V	
2	T12	R6	2	35	83.6	
0	T					
no	mm Ø	mm Ø	1NOS	mm	kN	
As =	1257 mm ²	% =	1.667	< 3 OK !		
v =	1.108 N/mm ²	400/d =	1.061	> 1 OK !		
v _c =	0.760 N/mm ²	(v _c + 0.4) =	1.160	> v DesignLinks required !		
(v - v _c)bv =	80.00 N/mm					
V max =	4.00 N/mm ²			v < v max! Beam Dimensions OK !		
Asv =	56.55 mm ²					
Sv =	167.88 mm					
Provide ! 1 NO R Ø 6mm @ 150 c/c				Link spacing is OK !		

6. Beam Deflection

M/bd ² =	4.40			Table:3.9
f _s =	238.66			
MFT =	1.03	< 2 OK !		
Basic (Span/d) ratio =	20			
Allow (Span/d) ratio =	20.58			
Actual (Span/d) ratio =	15.99	OK !		

TITLE: R.C~ FLOOR BEAM DESIGN TO BS 8110 ST. DESIGN BY : ABDULLA RAMEEZ
 PROJECT: HULHUMALE' LOT 10079 LICENCE NO : BDR2016038E
 BEAM NO: B4 JOB NO : _____ DATE : 28/4/2016

1. Beam Properties:

Beam Type: R
 h = 450 mm Cover = 35 mm
 b = 225 mm d = 377 mm 2T20
 L = 6.05 m d' = 55 mm 2T16 (2m)
 A Supported = 16.00 m² 3 R 6 @150 c/c

2. Material Properties:

f_{cu} = 25 N/mm² 2T16 (4.5m)
 f_y = 640 N/mm² 2T16 (4.5m)
 f_{yy} = 250 N/mm² 2T20
 γ_m = 1.5
 γ_m = 1.05

3. Beam loading

Dead Load
 Self - Weight of Wall = 7.02 KN/m
 Self - Weight of Beam = 1.49 KN/m
 Self - Weight of Slab = 4.20 KN/m²
 Finishes = 1.30 KN/m²
 Ceiling & M&E = 0.25 KN/m²

Dead load 'Gk = 143.46 kN
 Live load 'Qk = 2 kN/m²
 Point Load = a b
 25kN 0.92 m 5.13 m
 Ultimate load, n = 1.4Gk + 1.6Qk
 Ultimate load 'n = 41.66 kN/m

4. Beam Design

Critical Positive Moment @ Support K = 0.259 < K' = 0.156 > K' compression steel required ! z = 293 mm M = 207.14 kNm Cl:3.4.4.4	
Compression Steel (As') req = 470.53 mm² Bar No @ TOP = 2 NO of Layer = 2 (B1) 2 T20 (B2) 2 T16 (B3) 0 T As pro = 1030 mm ² As min = 203 mm ² OK ! As req = 471 mm ² As Pro = 1030 mm ² OK !	Tension steel (As) req = 1172.6 mm² Bar No @ BOTTOM = 4 NO of Layer 3 (T1) 2 T20 (T2) 2 T16 (T3) 2 T16 As pro = 1433 mm ² As min = 203 mm ² OK ! As req = 1173 mm ² As Pro = 1433 mm ² OK !

5. Beam shear

Maximum shear Force: V* = 149.5 kN <table border="1"> <thead> <tr> <th>Main Steel</th> <th>Link</th> <th>Legs</th> <th>Side cover</th> <th>Shear V</th> </tr> </thead> <tbody> <tr> <td>2 T20</td> <td>R6</td> <td>6</td> <td>35</td> <td>149.5</td> </tr> <tr> <td>2 T16</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>no mm Ø</td> <td>mm Ø</td> <td>3NOS</td> <td>mm</td> <td>kN</td> </tr> </tbody> </table> As = 1030 mm ² % = 1.215 < 3 OK ! v = 1.762 N/mm ² 400/d = 1.061 > =1 OK ! v _c = 0.684 N/mm ² (v _c + 0.4) = 1.084 > v Design Links required ! (v - v _c)bv = 242.45 N/mm V max = 4.00 N/mm ² v < v max! Beam Dimensions OK ! Asv = 169.65 mm ² Sv = 166.18 mm Provide ! 3 NO R Ø 6mm @ 150 c/c Link spacing is OK !	Main Steel	Link	Legs	Side cover	Shear V	2 T20	R6	6	35	149.5	2 T16					no mm Ø	mm Ø	3NOS	mm	kN	Cl:3.4.5.3 Table:3.7
Main Steel	Link	Legs	Side cover	Shear V																	
2 T20	R6	6	35	149.5																	
2 T16																					
no mm Ø	mm Ø	3NOS	mm	kN																	

6. Beam Deflection

M/bd ² = 6.48 f _g = 140.14 100A's/bd = 1.69 MFC = 1.36 MFT = 0.93 < 2 OK ! Basic (Span/d) ratio = 20 Allow (Span/d) ratio = 25.31 Actual (Span/d) ratio = 16.05 OK !	Table:3.9
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TITLE : REINFORCED CONCRETE TWO WAY SLAB DESIGN TO BS 8110

ST. DESIGN BY : ABDULLA RAMEEZ

PROJECT : LOT 10079

LICENCE NO : BDR2016038E

SLAB NO : SLAB - 1

JOB NO : _____ Date : 28/4/2016

Note : Rules in Clause 3.5.3.5 BS 8110 Part 1 should applied

1. Slab geometry

$L_y/L_x = 1.60 < \text{or} = 2$, Two way slab, So O.K.!

Width of slab	$L_x =$	3780	mm
Length of slab	$L_y =$	6052	mm
Slab thickness	$h =$	135	mm
Cover to bar	$c =$	30	mm

2. Slab loading

Superimposed Dead Load

Self-weight	=	3.24	kN/m ²
Superimposed D.L.	=	1.10	kN/m ²
Dead load	$G_k =$	4.34	kN/m ²
Live load	$Q_k =$	2.00	kN/m ²
Ultimate load	$n =$	9.28	kN/m ²

Finishes =	0.5	kN/m ²
Partition =	0.2	kN/m ²
M&E Services =	0.2	kN/m ²
Ceiling =	0.2	kN/m ²
	<u>1.10</u>	kN/m ²

Ultimate load, $n = 1.4G_k + 1.6Q_k$

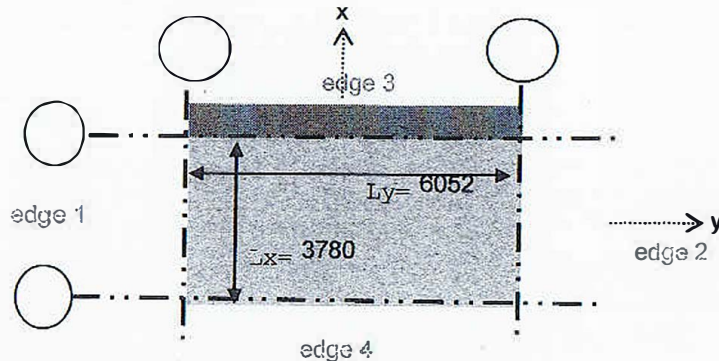
3. Slab material

Concrete characteristic strength	$f_{cu} =$	25	N/mm ²
Steel characteristic strength	$f_y =$	460	N/mm ²

4. Slab edges continuity

(1 continuous / 0 discontinuous)

Edge	Continuity
Edge 1	0
Edge 2	0
Edge 3	1
Edge 4	0



5. Ultimate moment

β_x = moment coefficient for sagging moment in direction of L_x
 β_y = moment coefficient for sagging moment in direction of L_y
 β_1 & β_2 = moment coefficient for hogging moment over edge 1 & 2
 β_3 & β_4 = moment coefficient for hogging moment over edge 3 & 4

Moment in x direction

$\nu_d = 3$ $\gamma = 0.421$

$\beta_x =$	0.066	$M_x =$	8.74	kNm/m width
$\beta_3 =$	0.088	$M_3 =$	11.55	kNm/m width
$\beta_4 =$	0.000	$M_4 =$	0.00	kNm/m width

Moment in y direction

$\beta_y =$	0.044	$M_y =$	5.77	kNm/m width
$\beta_1 =$	0.000	$M_1 =$	0.00	kNm/m width
$\beta_2 =$	0.000	$M_2 =$	0.00	kNm/m width

TITLE : REINFORCED CONCRETE TWO WAY SLAB DESIGN TO BS 8110

ST. DESIGN BY : ABDULLA RAMEEZ

PROJECT : LOT 10079

LICENCE NO : BDR2016038E

SLAB NO : SLAB - 1

JOB NO : Date : 28/4/2016

6. Steel reinforcement

Reinforcement in x direction

	Reinf.	Spacing	A _{sx prov}	A _{sx req}	u _x	L _x	Ultimate moment (kNm/m width)			
							Design	Resist.	Extra	Status
Bottom bar	10 @ 150		524	230	100	95.00	8.74	19.91	11.17	O.K !
Top bar edge 3	10 @ 150		524	308	100	94.52	11.65	19.81	8.16	O.K !
Top bar edge 4	10 @ 150		524	176	100	95.00	0.00	19.91	19.91	O.K !

Reinforcement in y direction

	Reinf.	Spacing	A _{sy prov}	A _{sy req}	u _y	L _y	Ultimate moment (kNm/m width)			
							Design	Resist.	Extra	Status
Bottom bar	10 @ 150		524	176	90	85.50	5.77	17.92	12.15	O.K !
Top bar edge 1	10 @ 150		524	176	90	85.50	0.00	17.92	17.92	O.K !
Top bar edge 2	10 @ 150		524	176	90	85.50	0.00	17.92	17.92	O.K !

Required minimum distribution steel = 0.13%bh

Bar provided, Reinf. 10 @ 300

A_{s,min.} = 176 mm²
A_{s,prov.} = 262 mm²

(Refer to Table 3.25 of BS 8110)
> Required, So O.K !

Min. steel to control thermal/shrinkage = 0.25%bh

Bar provided, Reinf. 10 @ 300

A_{s,min.} = 175.5 mm²
A_{s,prov.} = 262 mm²

(Refer to Cl. 3.12.11.2.9 of BS 8110)
> Required, So O.K !

7. Ultimate shear

Shear in x direction

	v	v _c		Ultimate shear (kN/m width)			
				Design	Resist.	Extra	Status
Edge 3 :	0.21	0.72	v < v _c , O.K !	20.61	72.04	51.43	O.K !
Edge 4 :	0.14	0.72	v < v _c , O.K !	14.45	72.04	57.59	O.K !

8. Deflection (Cl. 3.4.6)

$$M_x/b*d_x^2 = 0.87$$

$$\text{Where } d_x = 100 \text{ mm}$$

$$A_{sx \text{ req}} = 230 \text{ mm}^2$$

$$A_{sx \text{ prov}} = 524 \text{ mm}^2$$

$$f_s = (5/8)*f_y*(A_{s \text{ req}}/A_{s \text{ prov}}) = 126.16 \text{ N/mm}^2$$

$$\text{Tension reinforcement modification factor} = 0.55 + (477 - f_s) / \{120(0.9 + M/bd^2)\} \leq 2 = 2.00$$

$$\text{Basic } L_x/d_x = 26$$

$$\text{Allowable } L_x/d_x = 26 \times 2.00 = 52.00$$

$$\text{Actual } L_x/d_x = 3780 / 100.00 = 37.80 \Rightarrow \text{Deflection O.K !}$$

9. Cracking (Cl. 3.12.11.2.7)

$$3*d_x = 3 \times 100 = 300 \text{ mm or maximum 750 mm}$$

$$\text{Spacing between bars} = 150 - 10$$

$$= 140 \text{ mm} < 3d, \text{ So spacing O.K !}$$

$$\% 100A_s/bd = 0.52 > 0.3\%, \text{ So either limit the bar spacing to 163 mm or perform actual crack-width check !}$$

Since slab thickness \leq 200mm, no further checks required.

2. Material Properties:

$f_{cu} = 25 \text{ N/mm}^2$
 $f_y = 415 \text{ N/mm}^2$
 $f_{yy} = 250 \text{ N/mm}^2$
 $g_c = 1.5$
 $g_s = 1.05$

3. Beam loading

Ultimate Load = **6903.00 KN** Ultimate Load + 2% = 7041.06 KN
 Service load = **4855.90 KN**

4. Strip Dimensions

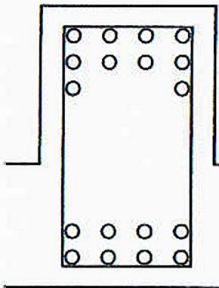
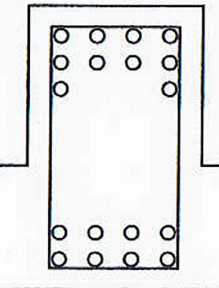
Assumed width = 1.60 m
 Assumed length = 22.39 m
 strip thickness = 350 mm
 Bearing capacity = 150 KN
 Area Required = 32.37 m²
 Required width = 1.57 m
 New Area Required = 35.10 m² Size OK!

5. Strip Beam dimensions

beam h = 800 mm
 beam b = 450 mm
 Total length of beam = 22.39 m
 d = 730 mm
 Weight of Strip and Beam = 409.70 KN
 Design upward pressure = 196.56 KN/m²

6. Foundation Beam Design

Udl on Strip beam = **314.50 KN/m**
 L = 3.77 m
 Cover = 80 mm
 Design Moment = **446.76 KN/m**
 d = 698 mm

<p>DESIGN MOMENT = $K = 0.082 < K' = 0.156 < K'$, Section is Singly Reinforced ! $M = 446.76 \text{ KNm}$ $z = 628 \text{ mm}$ $A_s \text{ req} = 1805 \text{ mm}^2$ Bar No @ BOTTOM = 6 NO of Layer : 3</p> <table border="0"> <tr> <td>(T1) 4</td> <td>T20</td> <td>1257</td> <td></td> </tr> <tr> <td>(T2) 4</td> <td>T16</td> <td>804</td> <td></td> </tr> <tr> <td>(T3) 2</td> <td>T12</td> <td>226</td> <td></td> </tr> <tr> <td colspan="2">As pro =</td> <td>2287 mm²</td> <td></td> </tr> <tr> <td colspan="2">As min =</td> <td>468 mm²</td> <td>OK !</td> </tr> <tr> <td colspan="2">As req =</td> <td>1805 mm²</td> <td></td> </tr> <tr> <td colspan="2">As Pro =</td> <td>2287 mm²</td> <td>OK !</td> </tr> </table>	(T1) 4	T20	1257		(T2) 4	T16	804		(T3) 2	T12	226		As pro =		2287 mm²		As min =		468 mm²	OK !	As req =		1805 mm²		As Pro =		2287 mm²	OK !		<p>Cl:3.4.4.4</p>
(T1) 4	T20	1257																												
(T2) 4	T16	804																												
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As Pro =		2287 mm²	OK !																											
<p>Maximum Negative Moment @Support $K = 0.082 < K' = 0.156 < K'$, Section is Singly Reinforced ! $M = 446.76 \text{ KNm}$ $z = 627.7 \text{ mm}$ $A_s \text{ req} = 1805 \text{ mm}^2$ Bar No @ TOP = 6 NO of Layer : 3</p> <table border="0"> <tr> <td>(B1) 4</td> <td>T20</td> <td>1257</td> <td></td> </tr> <tr> <td>(B2) 4</td> <td>T16</td> <td>804</td> <td></td> </tr> <tr> <td>(B3) 2</td> <td>T12</td> <td>226</td> <td></td> </tr> <tr> <td colspan="2">As pro =</td> <td>2287 mm²</td> <td></td> </tr> <tr> <td colspan="2">As min =</td> <td>468 mm²</td> <td>OK !</td> </tr> <tr> <td colspan="2">As req =</td> <td>1805 mm²</td> <td></td> </tr> <tr> <td colspan="2">As Pro =</td> <td>2287 mm²</td> <td>OK !</td> </tr> </table>	(B1) 4	T20	1257		(B2) 4	T16	804		(B3) 2	T12	226		As pro =		2287 mm²		As min =		468 mm²	OK !	As req =		1805 mm²		As Pro =		2287 mm²	OK !		<p>Cl:3.4.4.4</p>
(B1) 4	T20	1257																												
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As pro =		2287 mm²																												
As min =		468 mm²	OK !																											
As req =		1805 mm²																												
As Pro =		2287 mm²	OK !																											

7. Beam shear

Maximum shear Force: $V^* = 474.14$ kN						Cl:3.4.5.3 Table:3.7																								
<table border="1"> <thead> <tr> <th colspan="2">Main Steel</th> <th>Link</th> <th>Legs</th> <th>Side cove</th> <th>Shear V</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>T20</td> <td>R10</td> <td>4</td> <td>60</td> <td>474.1</td> </tr> <tr> <td>4</td> <td>T16</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>no</td> <td>mm Ø</td> <td>mm Ø</td> <td>2NOS</td> <td>mm</td> <td>kN</td> </tr> </tbody> </table>							Main Steel		Link	Legs	Side cove	Shear V	4	T20	R10	4	60	474.1	4	T16					no	mm Ø	mm Ø	2NOS	mm	kN
Main Steel		Link	Legs	Side cove	Shear V																									
4	T20	R10	4	60	474.1																									
4	T16																													
no	mm Ø	mm Ø	2NOS	mm	kN																									
$A_s =$	2287 mm ²	% =	0.728 < 3 OK!																											
$v =$	1.510 N/mm ²	400/d =	1.000 > 1 OK!																											
$v_c =$	0.569 N/mm ²	($v_c + 0.4$) =	0.969 > v Design Links required!																											
$(v - v_c)bv =$	423.43 N/mm																													
$V_{max} =$	4.00 N/mm ²	$v < v_{max}$ Beam Dimensions OK!																												
$A_{sv} =$	314.16 mm ²																													
$S_v =$	176.21 mm																													
Provide ! 2 NO R Ø 10mm @ 175 c/c						Link spacing is OK!																								

8. Beam Deflection

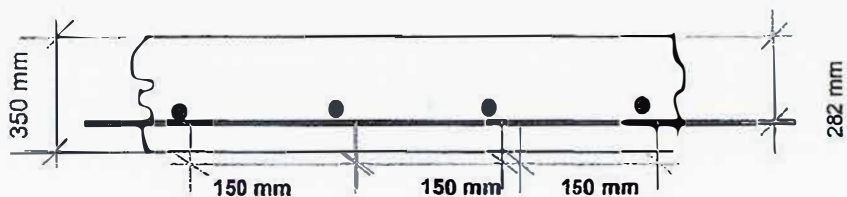
$M/bd^2 =$	2.04			Table:3.9
$f_s =$	218.39			
MFT =	1.28	< 2 OK!		
Basic (Span/d) ratio =	20			
Allow (Span/d) ratio =	25.67			
Actual (Span/d) ratio =	5.40	OK!		

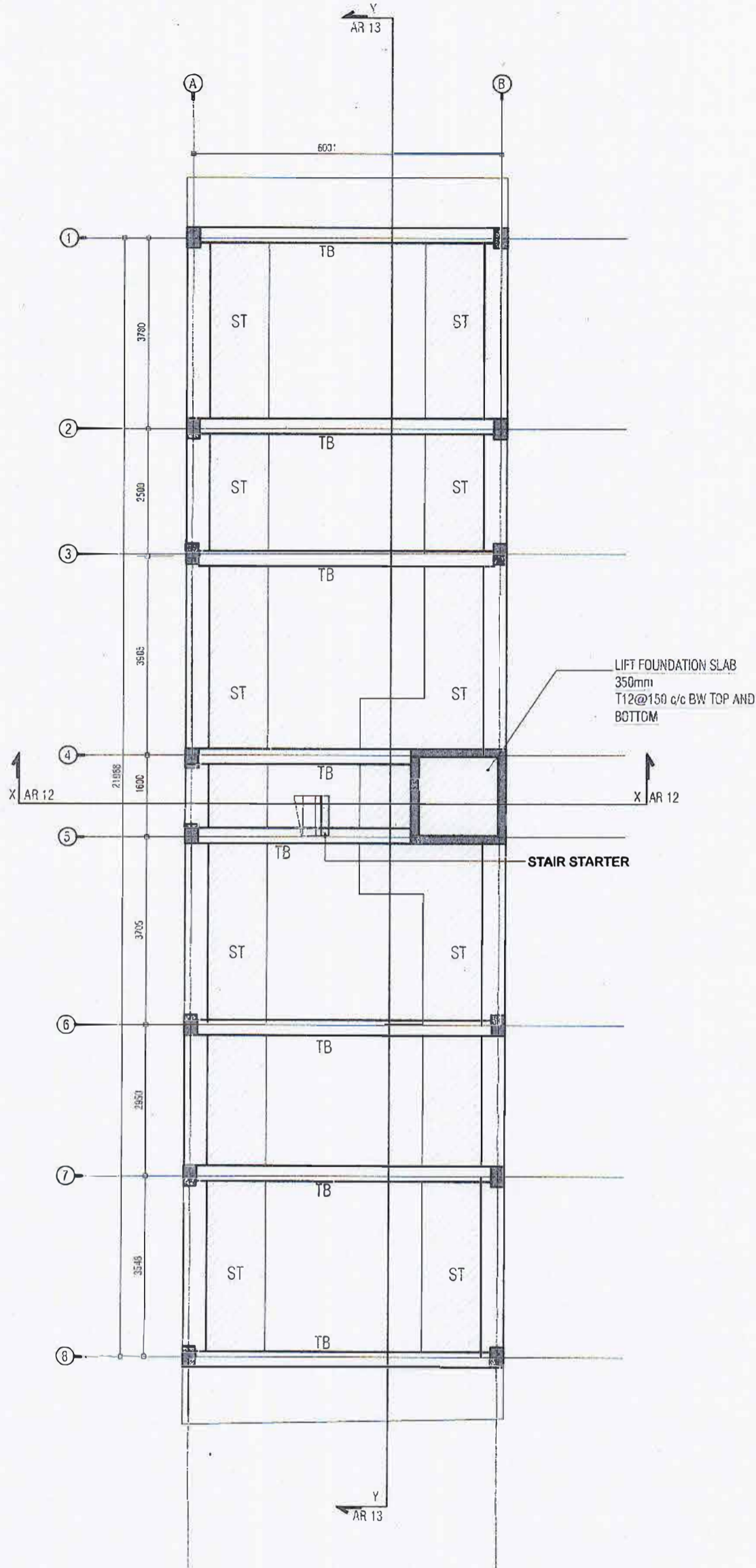
9. Strip Design

Cantilever Length = 1.15 m
 Assumed bar Diameter = T16
 Bent up Bar Diameter = T10
 Effective depth of strip = 282 mm
Design Moment = 129.98 KN/m
 $K = 0.065 < K' = 0.156 < K'$, Section is Singly Reinforced!
 $z = 260$ mm
 $A_s \text{ req} = 1269$ mm²
As Provided T16 @150 1340 (mm²/m) OK!

10. Shear resistance at a section

Maximum shear Force: $V^* = 170.62$ kN
 Design shear stress, $(v) = 0.61$ N/mm² $v \leq 0.8 \text{ sqrt}(f_{cu})$ or 5 N/mm^2 OK!
 $(100 \times A_s) / (b \times d) = 0.48$ < 3 OK!
 $400/d = 1.42$ > 1 OK!
 Ultimate shear stress, $v_c = 0.54$





GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFITS = 35MM
- *C COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = G30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

FOUNDATION PLAN

SCALE 1: 100



NOTE: FOUNDATION DEPTH AT -2100mm FROM NATURAL GROUND LEVEL

Ministry of Housing & Infrastructure
 APPROVED CHECKER
 STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.18
 Registration No: BPR2015022A1 A1-2015-022-001

APPROVED
 Housing Development Corporation Ltd.



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE

FOUNDATION PLAN

CLIENT

ADX HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:

AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE

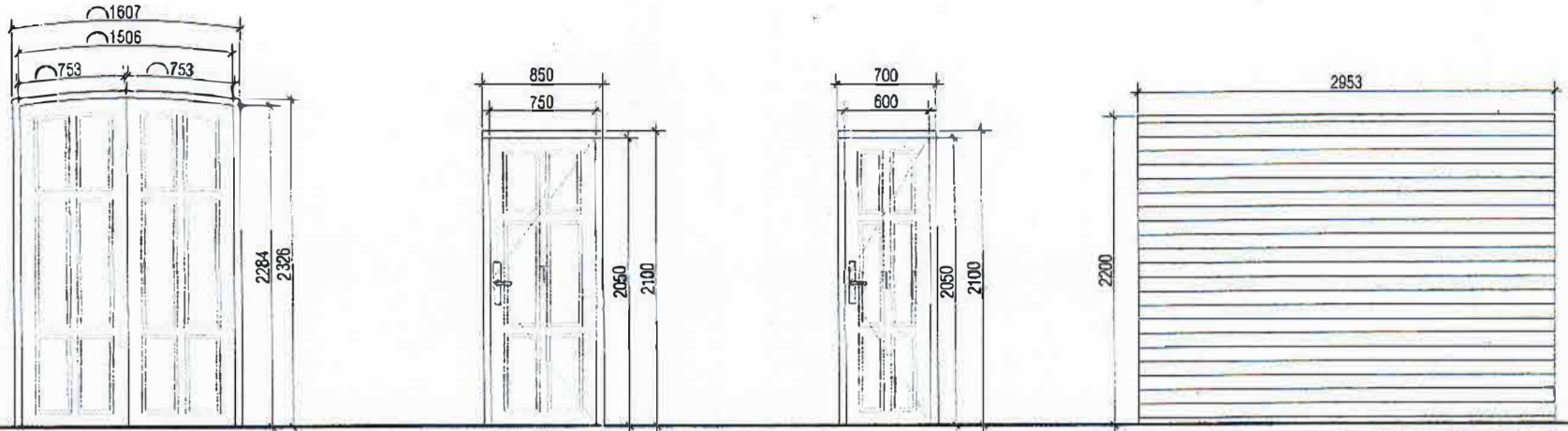
DETAIL DESIGN DRAWINGS
 ISSUED NO. 01 ISSUED BY SPACES DATE ISSUED 2005/2016

DRAWING NO:

10079-ST-30
 PROJECT NO:
 07
 PROJECT DATE:
 20 MAY 2016

REVISION NOTES:

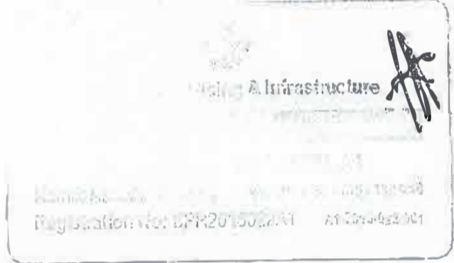
Annex 4b Elevator plan



Door no :	D1	D2	D3	RS1
Door :	MAIN ENTRANCE	APARTMENT ENTRANCE	ROOM ENTRANCE	ROLLER SHUTTER DOOR
Frame :	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	shall be proposed by Manufacturer and approved by Architect
Leaf :	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	SOLID TIMBER FINISHED WHITE (C/W proper epoxy coat)	PVC transparent and shall be specified by manufacturer
Glazing :				
Ironmongery :	Lock sets, Door handle, Door closer, Hinges shall be proposed by Manufacturer and approved by Architect	Lock sets, Door handle, Door closer, Hinges shall be proposed by Manufacturer and approved by Architect	Lock sets, Door handle, Door closer, Hinges shall be proposed by Manufacturer and approved by Architect	shall be proposed by Manufacturer and approved by Architect
Remarks :				GRADE OF IRONMONGERY USED FOR FINISH SHALL BE AT A GRADE WHICH WILL SUIT THE HARSH CONDITIONS OF THE COASTAL AREA

KEY
 FFL: FINISHED FLOOR LVL
 FG: FIXED GLASS
 G: GLASS
 T: TIMBER
 L: LOUVERED
 EQ: EQUAL SPACING

contractors shall work from figured dimensions only.
 discrepancies must be reported immediately to the architects.



NOTE
 - ALL MEASUREMENTS TO BE CHECKED ON SITE BEFORE FABRICATION.
 - PROVIDE RC LINTEL ABOVE ALL DOOR AND WINDOW UNITS NOT FIXED TO BEAMS.
 - ALL WOODEN DOORS AND DOOR PANEL SHOULD BE PUTTY SMOOTHED AND FINISHED

REVISION NOTES

spaces

PROJECT: HULHUMALE LOT 10079
 HULHUMALE, K. ATOLL
 REPUBLIC OF MALDIVES

STATUS: DETAILED DESIGN

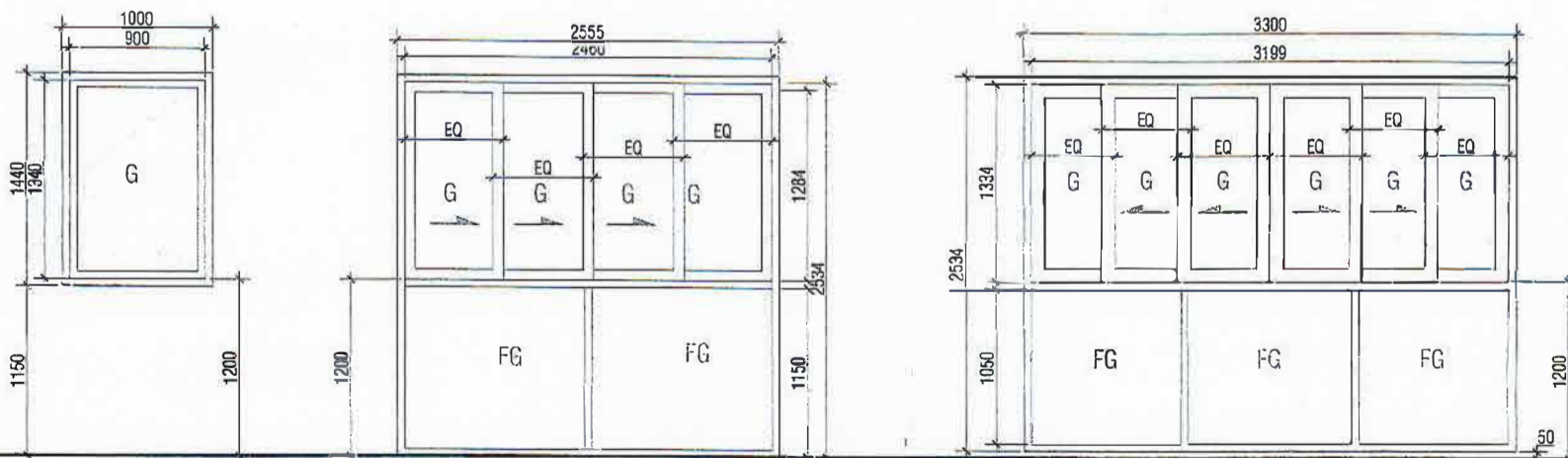
ISSUED BY: ISSUED BY: DATE ISSUED: 07/05/2016

CLIENT: ADK Holdings

CONTRACTOR: AS SHOWN
 DOORS AND WINDOW SCHEDULE

ARCHITECTURAL DESIGN BY: AHMED THAHSEEN
 STRUCTURAL DESIGN BY: ABDULLA RAMEEZ

PROJECT NO: 10079-AR-20
 PROJECT DATE: 23 MAY 2016



Door no :	W05	W06	W07
Door :	WINDOW 5	WINDOW 6	WINDOW 7
Frame :	WHITE POWDER COATED ALUMINIUM FRAME	WHITE POWDER COATED ALUMINIUM FRAME	WHITE POWDER COATED ALUMINIUM FRAME
Leaf :	WHITE POWDER COATED ALUMINIUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINIUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINIUM FRAME & GLAZING WHERE SPECIFIED
Glazing :	6mm CLEAR GLASS	6mm CLEAR GLASS	6mm CLEAR GLASS
Ironmongery :	Lock sets, Door Handle, Hinges shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Sliding tracks shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Sliding tracks shall be proposed by Manufacturer and approved by Architect
Remarks :	AREA = 1.2 SQM	AREA = 2.39 SQM	AREA = 2.77 SQM

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contractors shall work from figured dimensions only.
 discrepancies must be reported immediately to the architects.



NOTE
 - ALL MEASUREMENTS TO BE CHECKED ON SITE BEFORE FABRICATION.
 - PROVIDE RC LINTEL ABOVE ALL DOOR AND WINDOW UNITS NOT FIXED TO BEAMS.
 - ALL WOODEN DOORS AND DOOR PANEL SHOULD BE PUTTY SMOOTHED AND FINISHED

REVISION NOTES

spaces

PROJECT: HULHUMALE LOT 10079
 HULHUMALE, K. ATOLL
 REPUBLIC OF MALDIVES

STATUS: DETAILED DESIGN

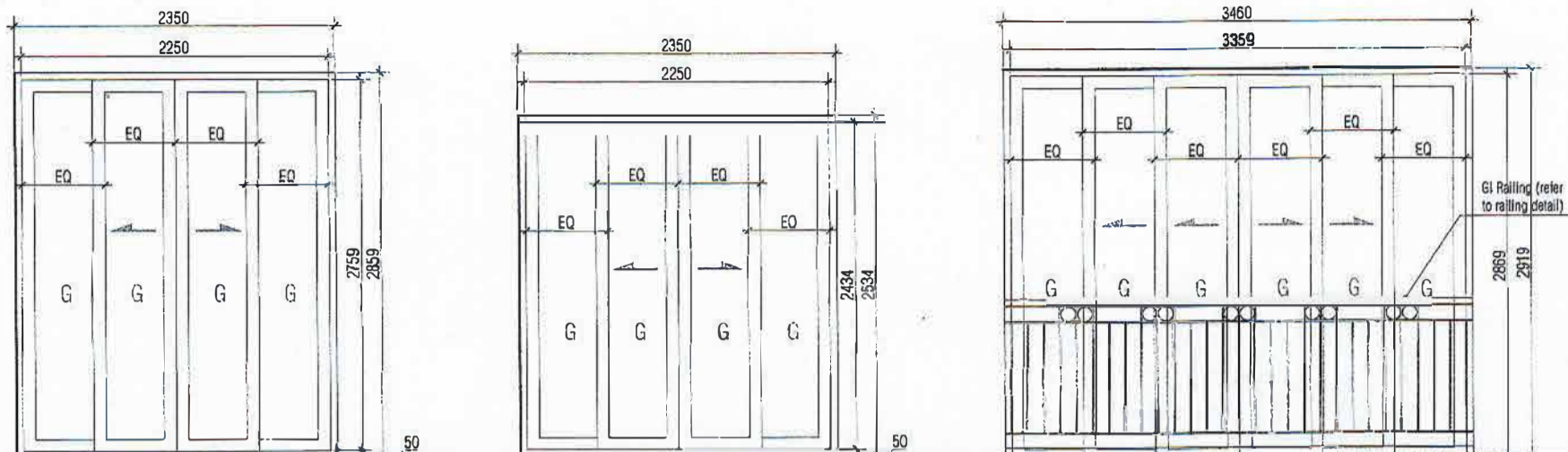
ISSUED BY: ISSUED BY: DATE ISSUED: 07/05/2016

CLIENT: ADK Holdings

CONTRACTOR: AS SHOWN
 DOORS AND WINDOW SCHEDULE

ARCHITECTURAL DESIGN BY: AHMED THAHSEEN
 STRUCTURAL DESIGN BY: ABDULLA RAMEEZ

PROJECT NO: 10079-AR-21
 PROJECT DATE: 20 MAY 2016



Door no :	SD2	SD3	SD4
Door :	SLIDING DOOR 2	SLIDING DOOR 3	SLIDING DOOR 4
Frame :	WHITE POWDER COATED ALUMINUM FRAME	WHITE POWDER COATED ALUMINUM FRAME	WHITE POWDER COATED ALUMINUM FRAME
Leaf :	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED
Glazing :	8mm CLEAR GLASS	8mm CLEAR GLASS	8mm CLEAR GLASS
Ironmongery :	Lock sets, Door Handle, Sliding Tracks shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Sliding Tracks shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Sliding Tracks shall be proposed by Manufacturer and approved by Architect
Remarks :	AREA= 2.86 SQM	AREA= 2.52 SQM	AREA= 5.9 SQM

KEY
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 G: GLASS
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Ministry of Housing & Infrastructure
APPROVED CHECKER
 STRUCTURAL CHECKER A1
 Name: Abdulla Rameez
 Registration No: BPR2015022A1
 VALIDITY: 14.10.15 - 13.10.18

NOTE
 - ALL MEASUREMENTS TO BE CHECKED ON SITE BEFORE FABRICATION.
 - PROVIDE RC LINTEL ABOVE ALL DOOR AND WINDOW UNITS NOT FIXED TO BEAMS.
 - ALL WOODEN DOORS AND DOOR PANEL SHOULD BE PUTTY SMOOTHED AND FINISHED

REVISION NOTES:

spaces

PROJECT
 HULHUMALE LOT 10078
 HULHUMALE, K. ATOLL
 REPUBLIC OF MALDIVES

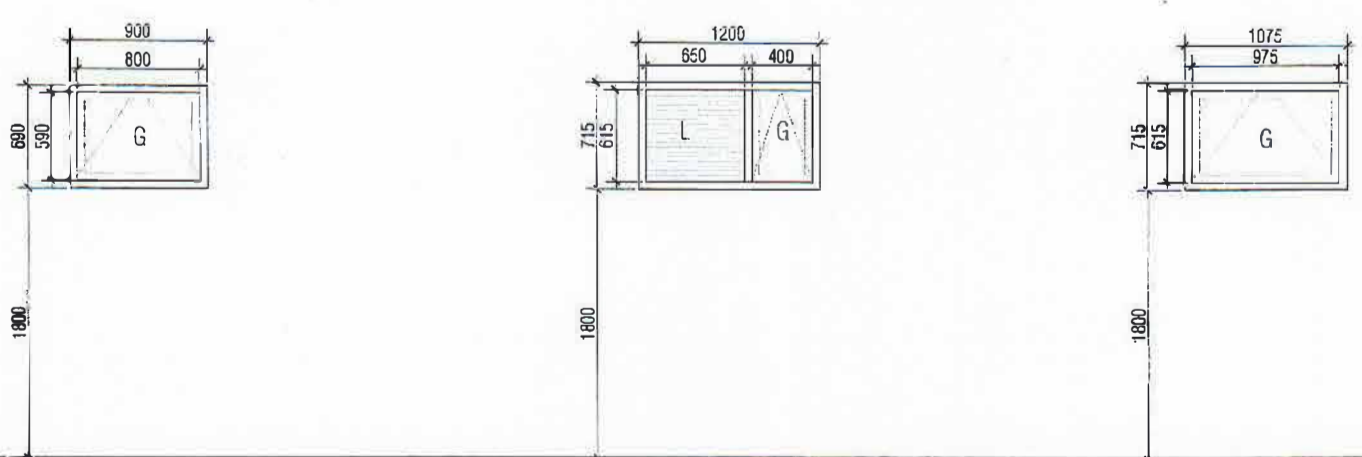
STATE
 DETAILED DESIGN

ISSUED BY : ISSUED BY : DATE ISSUED :
 C. SPACES 2005/06

CLIENT
 ADK Holdings
 MALDIVES

CONTENTS
 AS SHOWN
 DOORS AND WINDOW SCHEDULE

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 PROJECT NO:
 10078-AR-28
 PROJECT DATE:
 20 MAY 2015



Door no :	V1	V2	V3
Door :	VENT 1	VENT 2	VENT 3
Frame :	WHITE POWDER COATED ALUMINUM FRAME	WHITE POWDER COATED ALUMINUM FRAME	WHITE POWDER COATED ALUMINUM FRAME
Leaf :	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED	WHITE POWDER COATED ALUMINUM FRAME & GLAZING WHERE SPECIFIED
Glazing :	8mm CLEAR GLASS	8mm CLEAR GLASS	8mm CLEAR GLASS
Ironmongery :	Lock sets, Door Handle, Hinges etc shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Hinges etc shall be proposed by Manufacturer and approved by Architect	Lock sets, Door Handle, Hinges etc shall be proposed by Manufacturer and approved by Architect
Remarks :	AREA= 0.47 SQM	AREA= 0.65 SQM	AREA= 0.6 SQM

KEY
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 G: GLASS
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 L: LOUVERED
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Ministry of Housing & Infrastructure
APPROVED CHECKER
 STRUCTURAL CHECKER A1
 Name: Abdulla Rameez
 Registration No: BPR2015022A1
 VALIDITY: 14.10.15 - 13.10.18

NOTE
 - ALL MEASUREMENTS TO BE CHECKED ON SITE BEFORE FABRICATION.
 - PROVIDE RC LINTEL ABOVE ALL DOOR AND WINDOW UNITS NOT FIXED TO BEAMS.
 - ALL WOODEN DOORS AND DOOR PANEL SHOULD BE PUTTY SMOOTHED AND FINISHED

REVISION NOTES:

spaces

PROJECT
 HULHUMALE LOT 10078
 HULHUMALE, K. ATOLL
 REPUBLIC OF MALDIVES

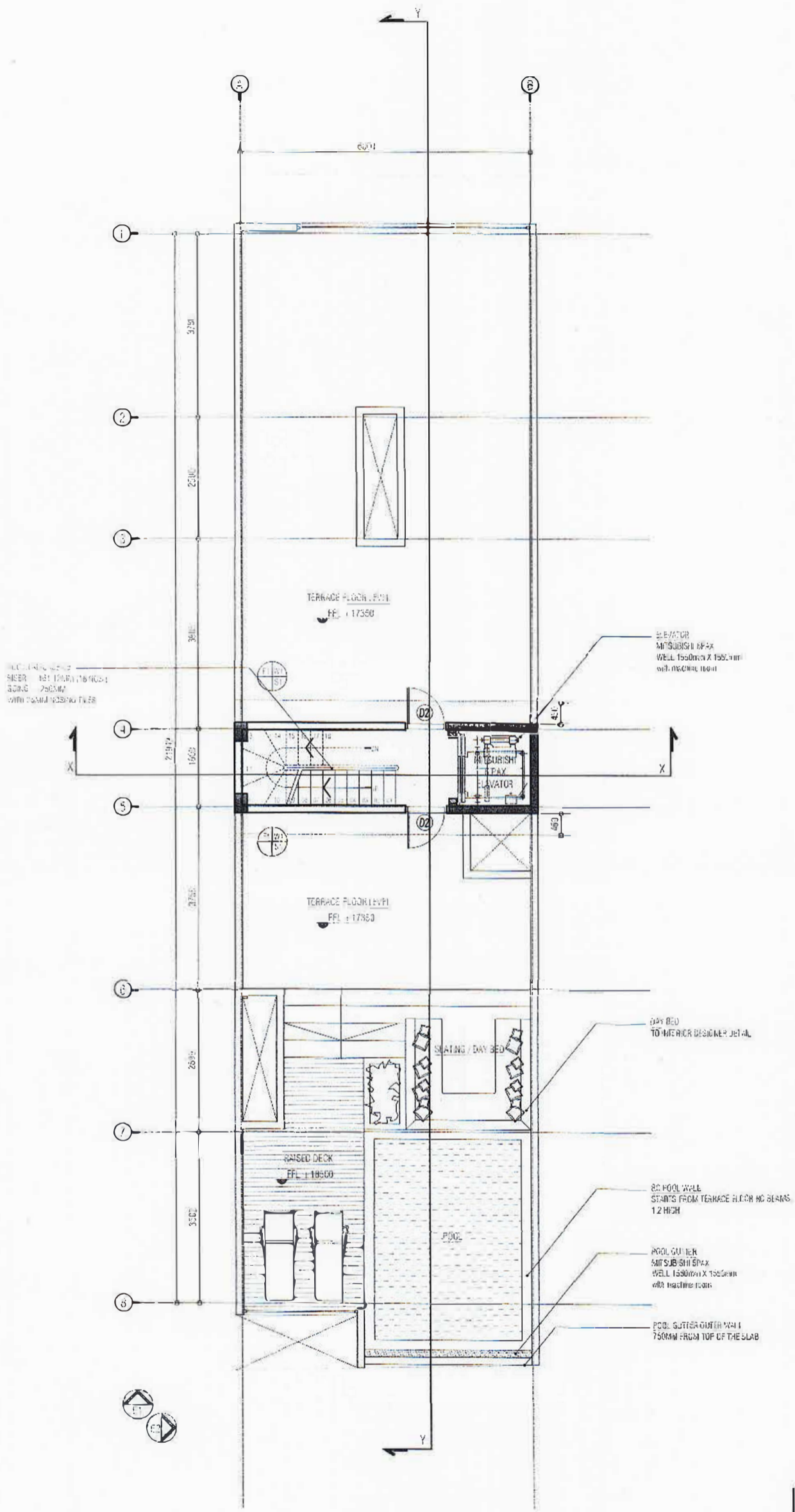
STATE
 DETAILED DESIGN

ISSUED BY : ISSUED BY : DATE ISSUED :
 C. SPACES 2005/06

CLIENT
 ADK Holdings
 MALDIVES

CONTENTS
 AS SHOWN
 DOORS AND WINDOW SCHEDULE

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 PROJECT NO:
 10078-AR-27
 PROJECT DATE:
 20 MAY 2015



INTERNAL FINISHES LEGEND	
FLOOR	
F1	- 1200mm X 1200mm WIDH HW TONGUE & GROOVE TIMBER PLANKS
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F5	- INDUSTRIAL PAINT
SKIRTING	
S1	- 12mm THICK X 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH
S2	- 12mm THICK X 100mm HIGH TILE SKIRTING
WALL	
W1	- 120mm THICK CEMENT & COCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.
W2	- 300 X 300 GLOSS HOMOGENEOUS WALL TILES
CEILING	
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME

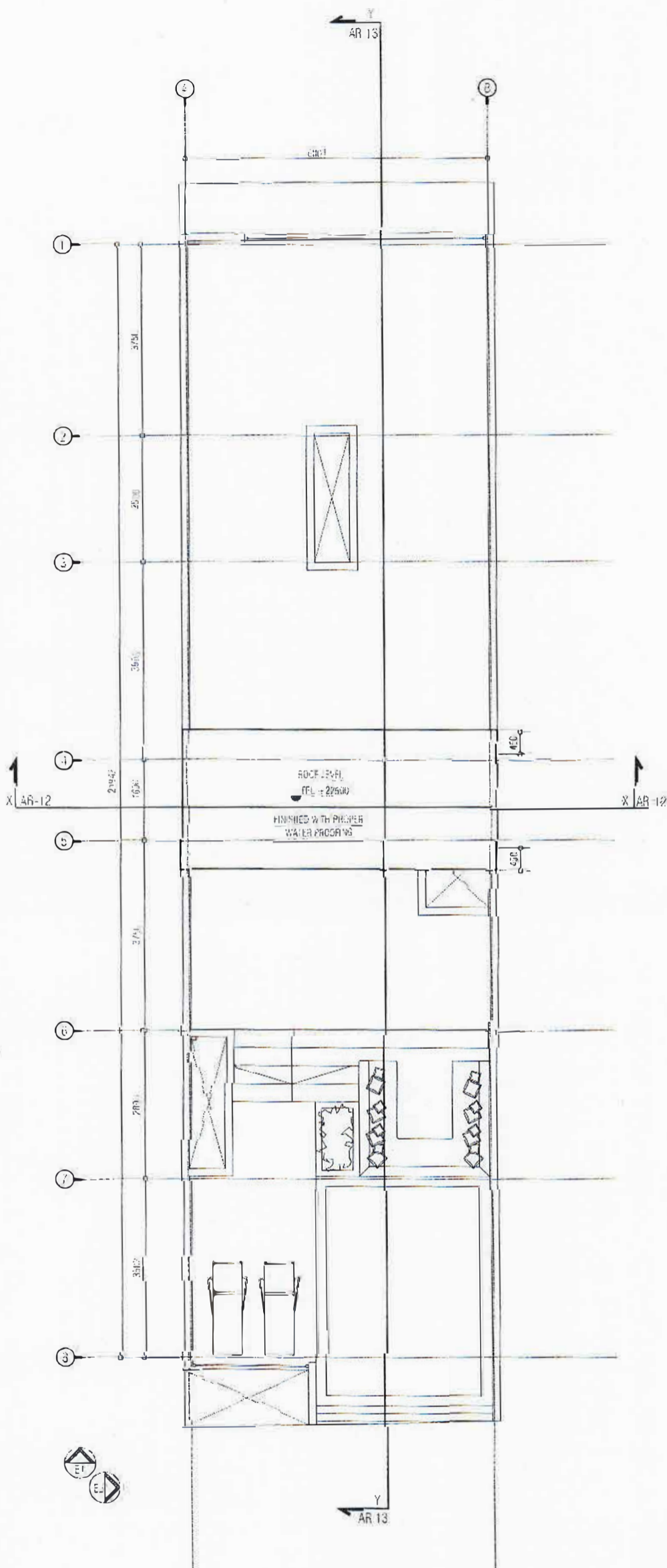
INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

- GENERAL NOTE.**
- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
 - 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
 - RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
 - PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
 - STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENEOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
 - ALL WALLS OF THE LOBBY SHALL BE FINISHED
 - ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENEOUS TILES APPROVED BY THE ARCHITECT
 - ALL TOILETS, SHOWERS, SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
 - TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
 - ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
 - ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
 - 'MASTERSEAL 550' OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
 - ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH 'REOMIX 720' OR EQUIVALENT CHEMICAL
 - 'MASTERTILE 30' OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
 - 'MASTERTILE 33C11' OR EQUIVALENT SHOULD BE USED FOR GROUT
- ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

TERRACE FLOOR PLAN
SCALE: 1:100

APPROVED
Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
STRUCTURAL CHECKER A1
Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
Registration No: BPR2015022A1 A1-2015-022-001



INTERNAL FINISHES LEGEND	
FLOOR	
F1	120mm x 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS
F2	600 x 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI GLOSS FINISH)
F3	300 x 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F4	600 x 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F5	INDUSTRIAL PAINT
SKIRTING	
S1	12mm THICK x 100mm HIGH WOOD SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH
S2	12mm THICK x 100mm HIGH TILE SKIRTING
WALL	
W1	120mm THICK CEMENT BLOCKS WITH 13mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PART FINISH OR WALL PUTTY.
W2	600 x 300 GLOSS HOMOGENEOUS WALL TILES
CEILING	
C1	EXPOSED SLAB WITH SMOOTH PUTTY FINISH
C2	GYPSUM BOARD CEILING ON TIMBER FRAME

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

GENERAL NOTE:

- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
- 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
- RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
- PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
- STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENEOUS TILES C/W MOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
- ALL WALLS OF THE LOBBY SHALL BE FINISHED
- ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600x600mm HOMOGENEOUS TILES APPROVED BY THE ARCHITECT
- ALL TOILETS, SHOWERS SLICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
- TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
- ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
- ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
- "WATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
- ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 770" OR EQUIVALENT CHEMICAL
- "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
- "MASTERTILE 530mm" OR EQUIVALENT SHOULD BE USED FOR GROUT.

ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

ROOF SLAB PLAN

SCALE: 1:100



APPROVED

Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
 Registration No: BPR2015022A1 A1-2015-022-001

PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -ROOF SLAB PLAN-

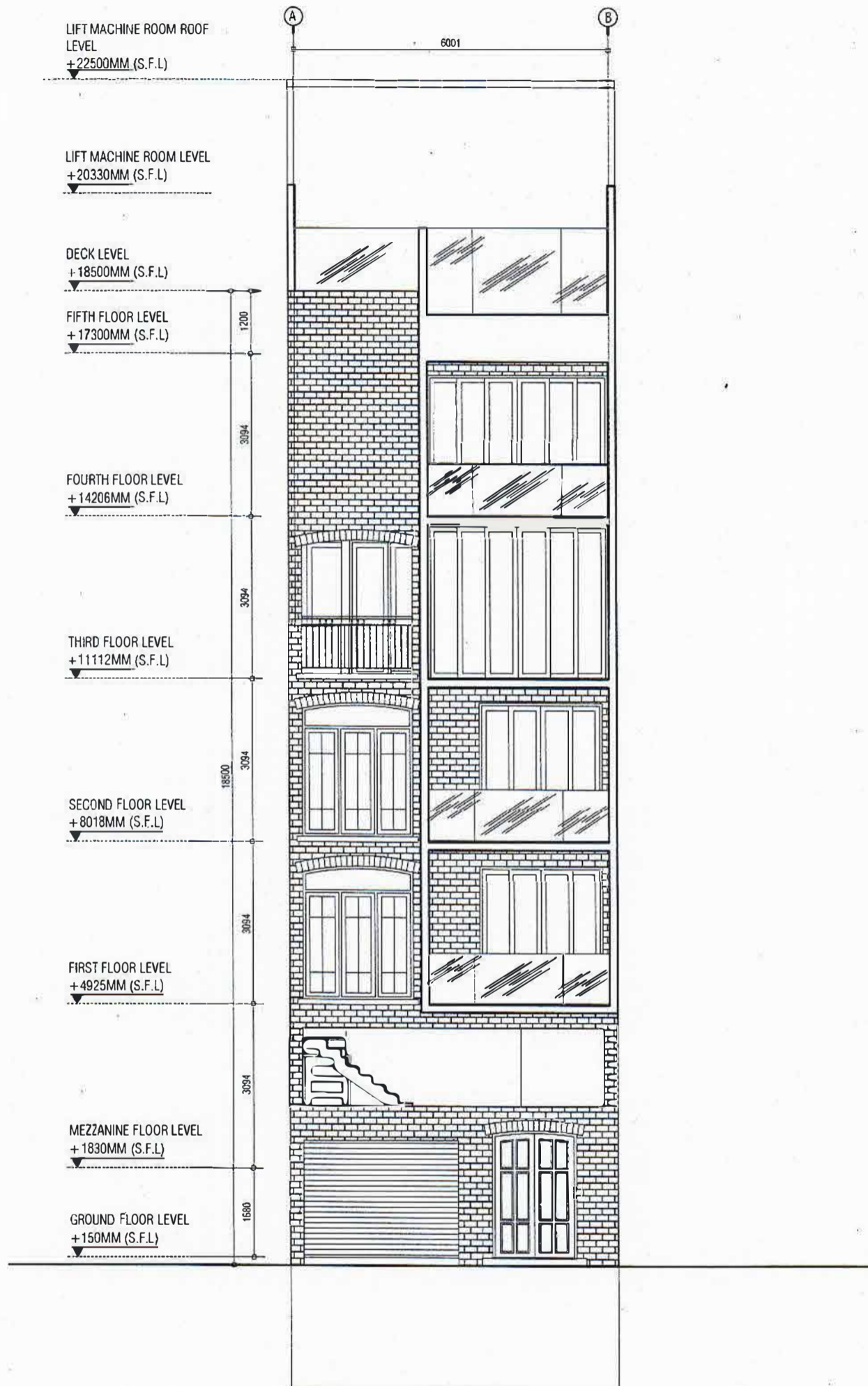
CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE
 DETAIL DESIGN DRAWINGS
 ISSUED NO. 01
 ISSUED BY SPACES
 DATE ISSUED 20/05/2016

DRAWING NO.
 10079-AR-11
 PROJECT NO.
 07
 PROJECT DATE
 20 MAY 2016

REVISION NOTES:



FRONT ELEVATION E1

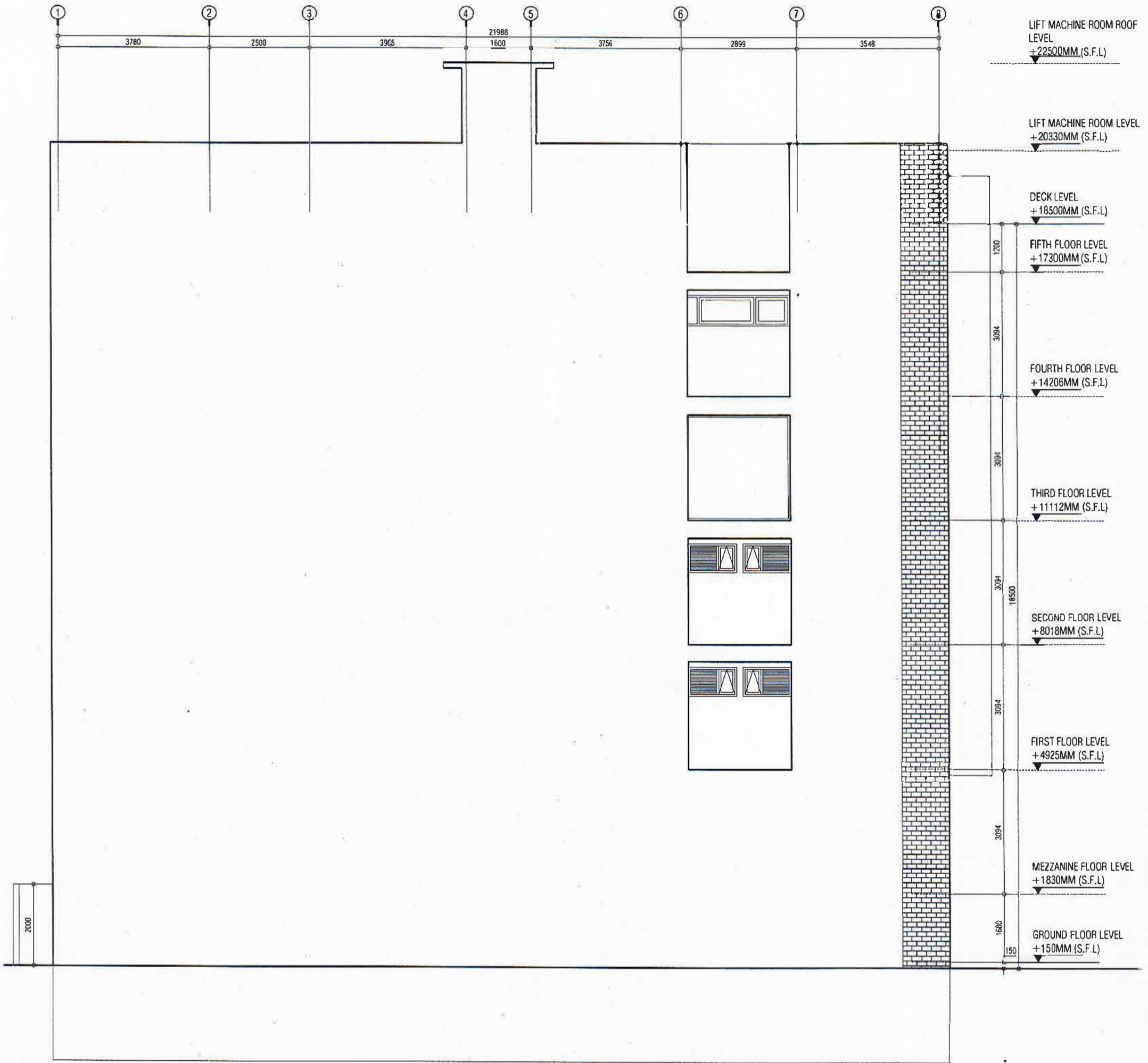
SCALE 1:100



APPROVED
Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
Name: Abdulla Rameez
Registration No: BPR2016022A1
A1-2015-027-001

	PROJECT HULHUMALE' LOT 10079 05 STOREY RESIDENTIAL BUILDING	DRAWING TITLE -FRONT ELEVATION E1	CLIENT AOK HOLDINGS	ARCHITECTURAL DESIGN BY: AHMED THAHSEEN BDR2014028A	STAGE DETAIL DESIGN DRAWINGS	DRAWING NO: 10079- AR - 14	REVISION NOTES: _____ _____ _____			
	HULHU MALE', K. ATOLL REPUBLIC OF MALDIVES	MALDIVES	STRUCTURAL DESIGN BY: ABDULLA RAMEEZ BDR2016038E	<table border="1"> <tr> <th>ISSUED NO.</th> <th>ISSUED BY</th> <th>DATE ISSUED</th> </tr> <tr> <td>01</td> <td>SPACES</td> <td>20052016</td> </tr> </table>	ISSUED NO.	ISSUED BY		DATE ISSUED	01	SPACES
ISSUED NO.	ISSUED BY	DATE ISSUED								
01	SPACES	20052016								



SIDE ELEVATION E2

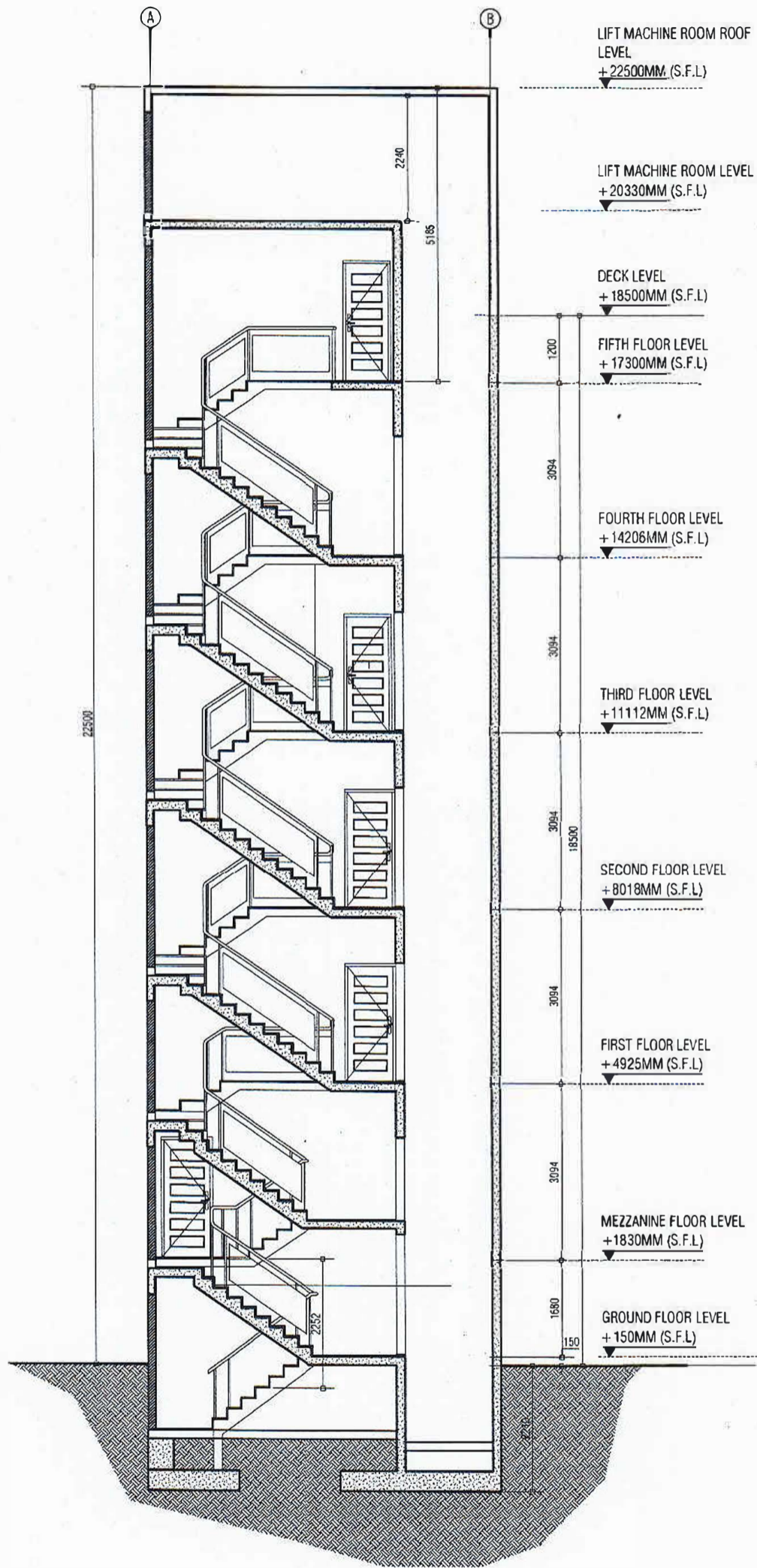
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APPROVED
Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.4.10.1513.10.15
 Registration No: BPR2015022A1 A1-2015-022-061

	PROJECT HULHUMALE' LOT 10079 05 STOREY RESIDENTIAL BUILDING	DRAWING TITLE -SIDE ELEVATION E2	CLIENT ADK HOLDINGS MALDIVES	ARCHITECTURAL DESIGN BY: AHMED THAHSEEN BDR2014028A STRUCTURAL DESIGN BY: ABDULLA RAMEEZ BDR2016038E	STAGE DETAIL DESIGN DRAWINGS	DRAWING NO: 10079- AR - 15 PROJECT NO: 07 PROJECT DATE: 20 MAY 2016	REVISION NOTES:
	HULHU MALE', K. ATOLL REPUBLIC OF MALDIVES				ISSUED NO. 01 ISSUED BY SPACES DATE ISSUED 20/05/2016		



SECTION THROUGH X - X

SCALE 1 : 100



APPROVED
Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
 Name: Abdulla Pameez
 Registration No: BPR2016022A1



PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHU MALE', K. ATOLL
 REPUBLIC OF MALDIVES

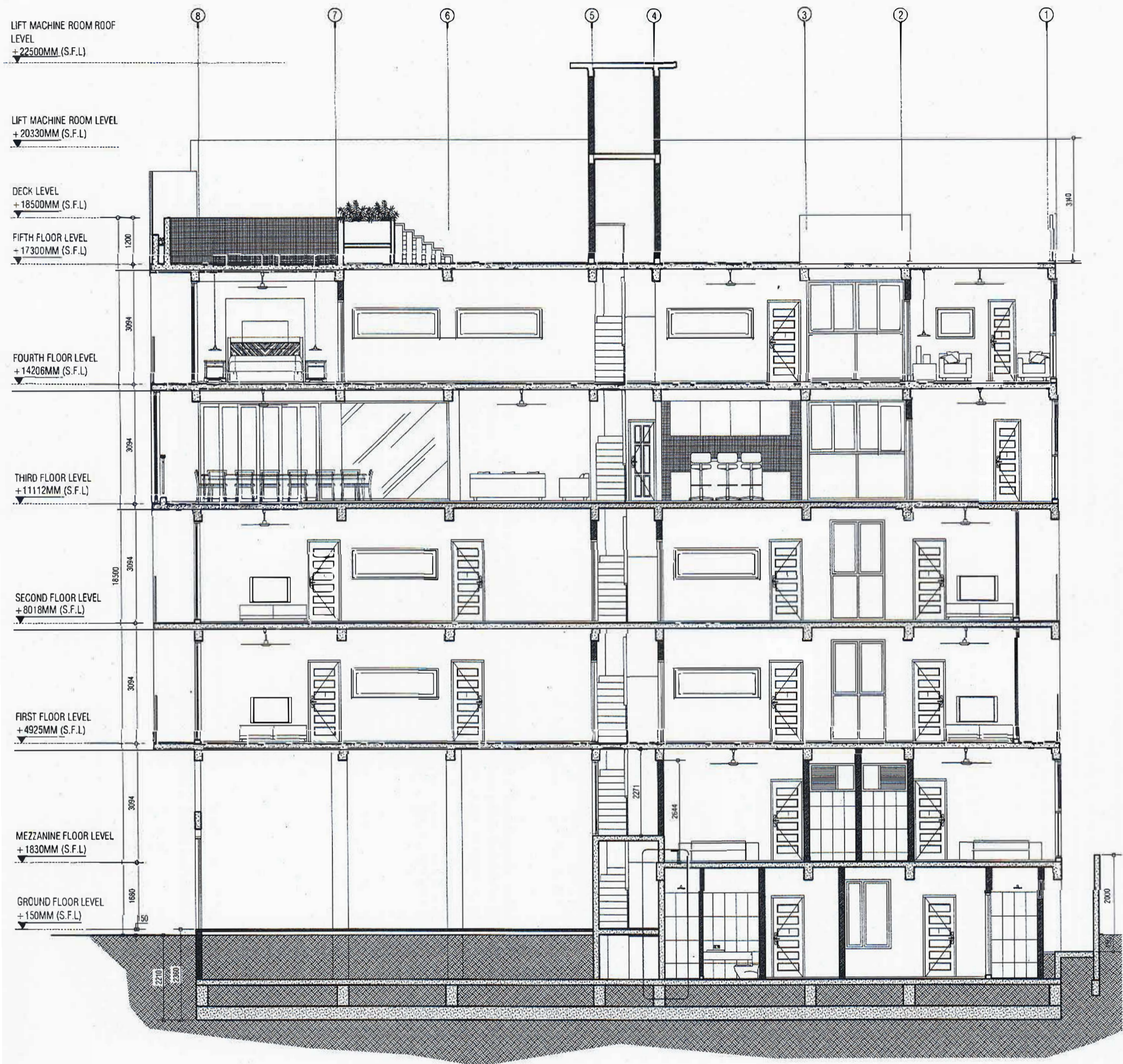
DRAWING TITLE
 SECTION THROUGH X-X

CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

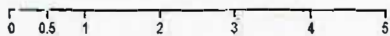
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 ISSUED BY SPACES
 DATE ISSUED 20/05/2016

DRAWING NO.
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 PROJECT NO.
 07
 PROJECT DATE:
 20 MAY 2016



SECTION THROUGH Y - Y

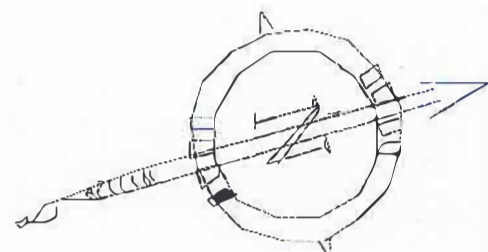
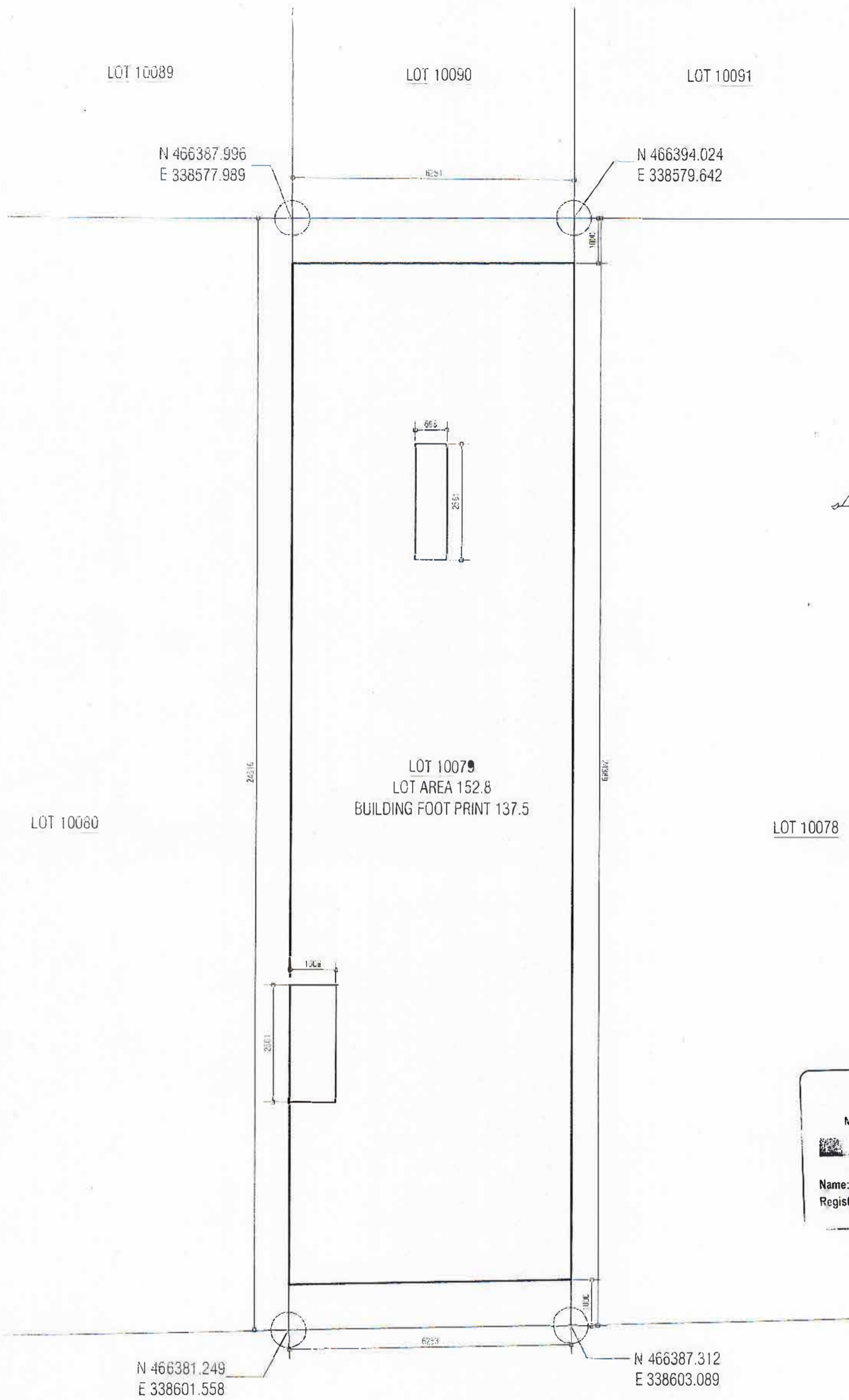
SCALE 1:100



APPROVED
Housing Development
Corporation Ltd.

Ministry of Housing & Infrastructure
SUBJECT'S REGISTRATION NO. A1
19/05/2016 13:10:16
19/05/2016 13:10:16

	PROJECT HULHUMALE' LOT 10079 05 STOREY RESIDENTIAL BUILDING HULHU MALE', K. ATOLL REPUBLIC OF MALDIVES	DRAWING TITLE SECTION THROUGH Y-Y	CLIENT ADK HOLDINGS MALDIVES	ARCHITECTURAL DESIGN BY: AHMED THAHSEEN BDR2014028A STRUCTURAL DESIGN BY: ABDULLA RAMEEZ BDR2016038E	STAGE DETAIL DESIGN DRAWINGS ISSUED NO. 01 ISSUED BY SPACES DATE ISSUED 20/05/2016	DRAWING NO: 10079- AR - 13 PROJECT NO: 07 PROJECT DATE: 20 MAY 2016	REVISION NOTES:
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Ministry of Housing & Infrastructure
APPROVED CHECKER
 STRUCTURAL CHECKER
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
 Registration No: BPR2015022A1 A1-2015-022-001

SITE PLAN

SCALE 1:100



ROAD TYPE C1

APPROVED
 Housing Development Corporation Ltd.

PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHUMALE' K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -SITE PLAN

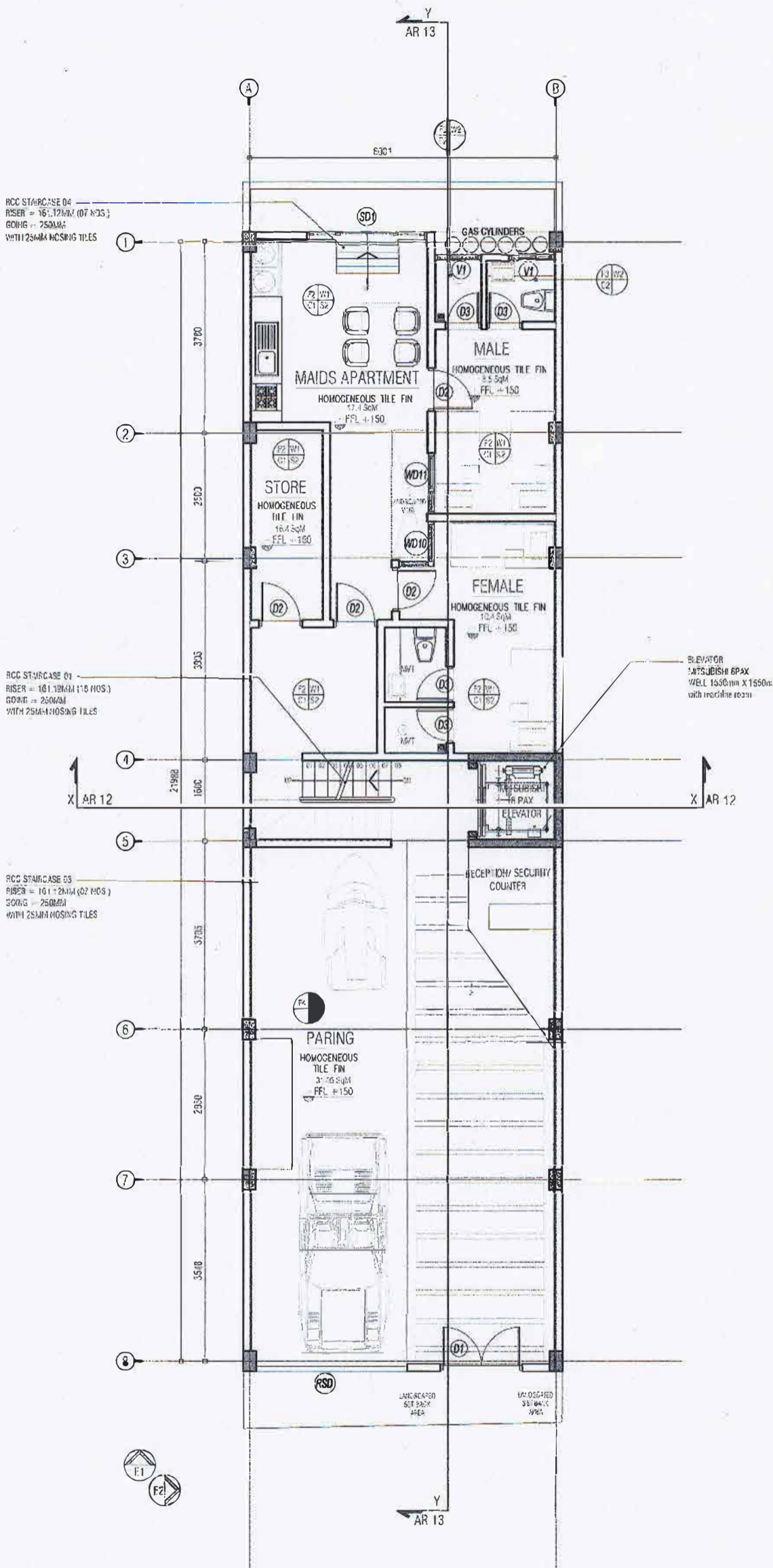
CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE
 DETAIL DESIGN DRAWINGS
 ISSUED NO. 01 ISSUED BY SPACES DATE ISSUED 20052016

DRAWING NO:
 10079-AR-03
 PROJECT NO:
 07
 PROJECT DATE:
 20 MAY 2016

REVISION NOTES:



INTERNAL FINISHES LEGEND	
FLOOR	
F1	- 1200mm X 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F5	- INDUSTRIAL PAINT
SKIRTING	
S1	- 12mm THICK x 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH
S2	- 12mm THICK x 100mm HIGH TILE SKIRTING
WALL	
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.
W2	- 600 X 300 GLOSS HOMOGENEOUS WALL TILES
CEILING	
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

- GENERAL NOTE:
- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
 - 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
 - RC PARTIALS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
 - PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
 - STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENEOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
 - ALL WALLS OF THE LOBBY SHALL BE FINISHED
 - ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENEOUS TILES APPROVED BY THE ARCHITECT
 - ALL TOILETS, SHOWERS, SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
 - TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
 - ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
 - ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
 - "MATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
 - ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "ROMAX 720" OR EQUIVALENT CHEMICAL
 - "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
 - "MASTERTILE 630mm" OR EQUIVALENT SHOULD BE USED FOR GROUT
- ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

GROUND FLOOR AND BASEMENT PLAN
SCALE 1:100



APPROVED
Housing Development Corporation Ltd.



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHUMALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-GROUND FLOOR AND BASEMENT-

CLIENT
ADK HOLDINGS
MALDIVES

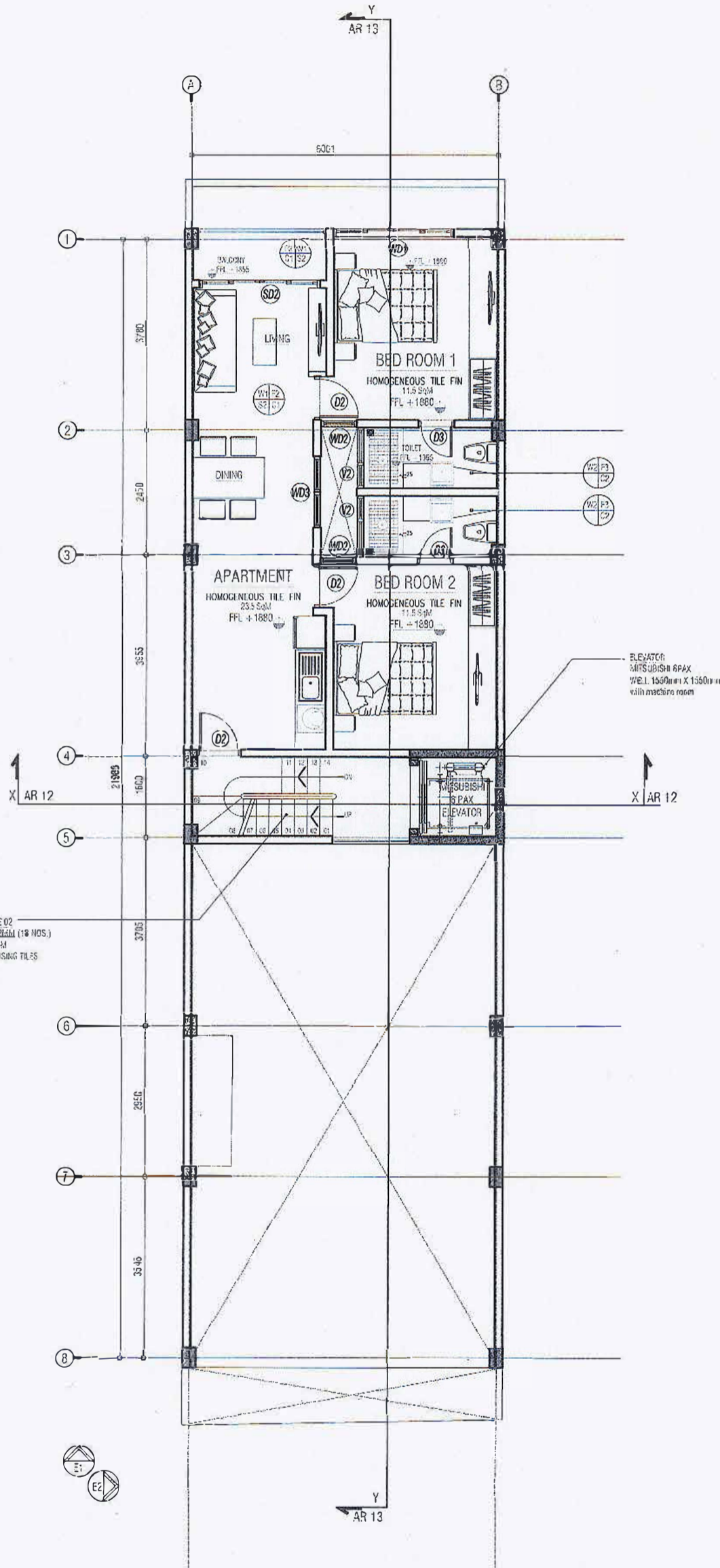
ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BOR2014028A

STRUCTURAL DESIGN BY:
ABOULLA RAMEEZ
BOR2016038E

STAGE
DETAIL DESIGN DRAWINGS

ISSUED NO.
01

10079-AR-04
Ministry of Housing & Infrastructure
PROJECT NO.
10079-AR-04
ISSUED DATE
20 MAY 2016
STRUCTURAL CHECKER A1
Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
Registration No: BPR2015022A1 A1-2015-022-091



INTERNAL FINISHES LEGEND	
FLOOR	
F1	- 1200mm X 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS
F2	- 600 X 800 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON-SLIP)
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON-SLIP)
F5	- INDUSTRIAL PAINT
SKIRTING	
S1	- 12mm THICK x 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH
S2	- 12mm THICK x 100mm HIGH TILE SKIRTING
WALL	
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.
W2	- 500 X 300 GLOSS HOMOGENEOUS WALL TILES
CEILING	
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME

INTERNAL FINISHING CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

GENERAL NOTE:

- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
- 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
- RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
- PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
- STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENOUS TILES C/W MOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
- ALL WALLS OF THE LOBBY SHALL BE FINISHED
- ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENOUS TILES APPROVED BY THE ARCHITECT
- ALL TOILETS, SHOWERS, SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
- TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
- ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
- ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
- "MATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
- ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "RECMIX 720" OR EQUIVALENT CHEMICAL.
- "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
- "MASTERTILE 530m" OR EQUIVALENT SHOULD BE USED FOR GROUT

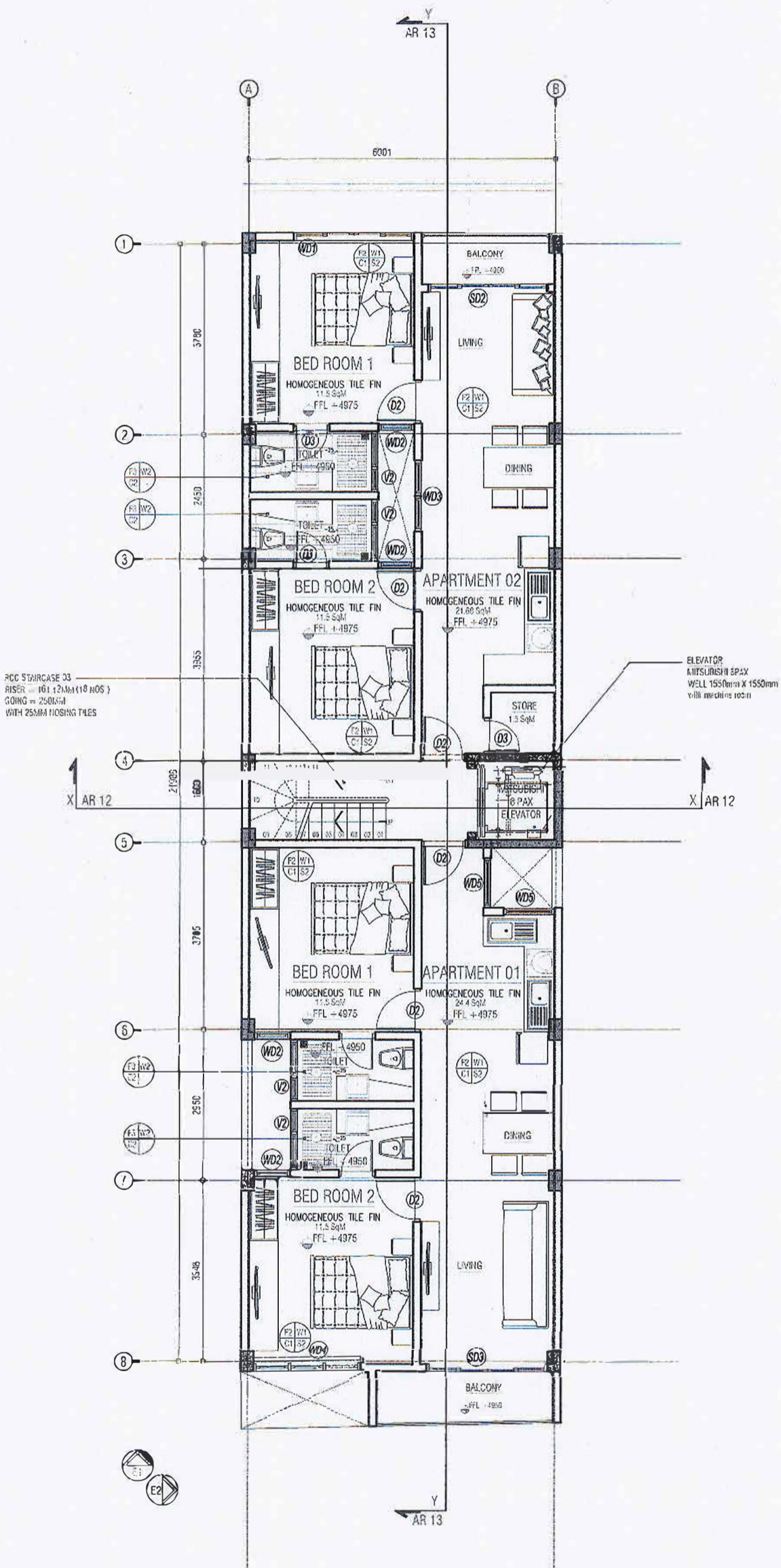
ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

MEZZANINE FLOOR PLAN
SCALE: 1:100



APPROVED
Housing Development Corporation Ltd.

	PROJECT HULHUMALE' LOT 10079 05 STOREY RESIDENTIAL BUILDING HULHUMALE, K. ATOLL REPUBLIC OF MALDIVES	DRAWING TITLE -MEZZANINE FLOOR PLAN-	CLIENT ADK HOLDINGS MALDIVES	ARCHITECTURAL DESIGN BY: AHMED THAHSEEN BDR2014028A STRUCTURAL DESIGN BY: ABDULLA RAMEEZ BOR2016038E	STAGE DETAIL DESIGN DRAWINGS ISSUED NO. 01 ISSUED BY [Signature] DATE ISSUED 20 MAY 2016	DRAWING NO. 10079-AR-05 PROJECT NO. Ministry of Housing & Infrastructure PROJECT DATE 20 MAY 2016 STRUCTURAL CHECKER A1 Name: Abdulla Rameez Registration No: BPR2015022A1 VALIDITY: 14.10.15 - 13.10.19 A1-2015-022-001
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INTERNAL FINISHES LEGEND				
FLOOR				
F1	- 1200mm X 1200mm WIDE HW TONGUE & GROOVE TIMBER PLANKS			
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)			
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON-SKID)			
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON-SKID)			
F5	- INDUSTRIAL PAINT			
SKIRTING				
S1	- 12mm THICK x 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH			
S2	- 12mm THICK x 100mm HIGH TILE SKIRTING			
WALL				
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.			
W2	- 600 x 300 GLOSS HOMOGENEOUS WALL TILES			
CEILING				
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH			
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME			

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

- GENERAL NOTE:
- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
 - 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
 - RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
 - PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
 - STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENEOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
 - ALL WALLS OF THE LOBBY SHALL BE FINISHED
 - ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENEOUS TILES APPROVED BY THE ARCHITECT
 - ALL TOILETS, SHOWERS, SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
 - TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
 - ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
 - ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
 - "WATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
 - ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL
 - "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
 - "MASTERTILE 530mm" OR EQUIVALENT SHOULD BE USED FOR GROUT
- ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

FIRST FLOOR PLAN
SCALE 1:100

APPROVED
Housing Development Corporation Ltd.



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHUMALE, K. ATOLL
REPUBLIC OF MALDIVES

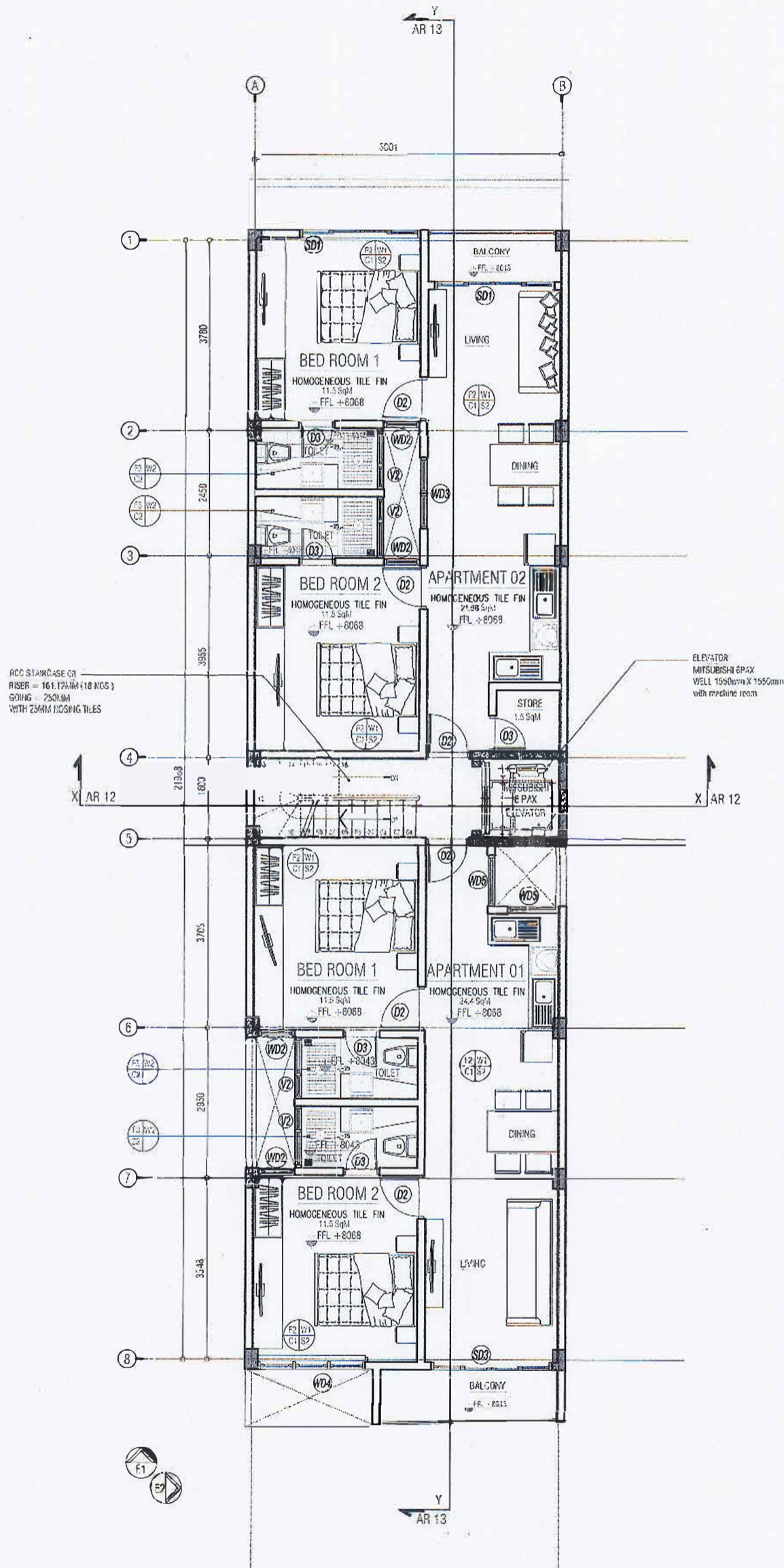
DRAWING TITLE
FIRST FLOOR PLAN

CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO. 01

Ministry of Housing, Urban Planning and Infrastructure
10079/AR/06/structure
ACCREDITED CHECKER
STRUCTURAL CHECKER A1
Name: Abdulla Rameez
Date: 20 MAY 2016
Registration No: BDR2015022A1



INTERNAL FINISHES LEGEND	
FLOOR	
F1	- 1200mm x 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI GLOSS FINISH)
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F4	- 800 X 800 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)
F5	- INDUSTRIAL PAINT
SKIRTING	
S1	- 12mm THICK x 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH
S2	- 12mm THICK x 100mm HIGH TILE SKIRTING
WALL	
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.
W2	- 500 x 300 GLOSS HOMOGENEOUS WALL TILES
CEILING	
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

GENERAL NOTE:

- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
- 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
- RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
- PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
- STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
- ALL WALLS OF THE LOBBY SHALL BE FINISHED
- ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENOUS TILES APPROVED BY THE ARCHITECT
- ALL TOILETS, SHOWERS SLICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
- TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
- ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
- ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
- "MATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
- ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL.
- "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
- "MASTERTILE 530m" OR EQUIVALENT SHOULD BE USED FOR GROUT

ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

SECOND FLOOR PLAN

SCALE 1:100



APPROVED
Housing Development Corporation Ltd.

spaces inc.

PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHU MALE, K' ATOLL
REPUBLIC OF MALDIVES

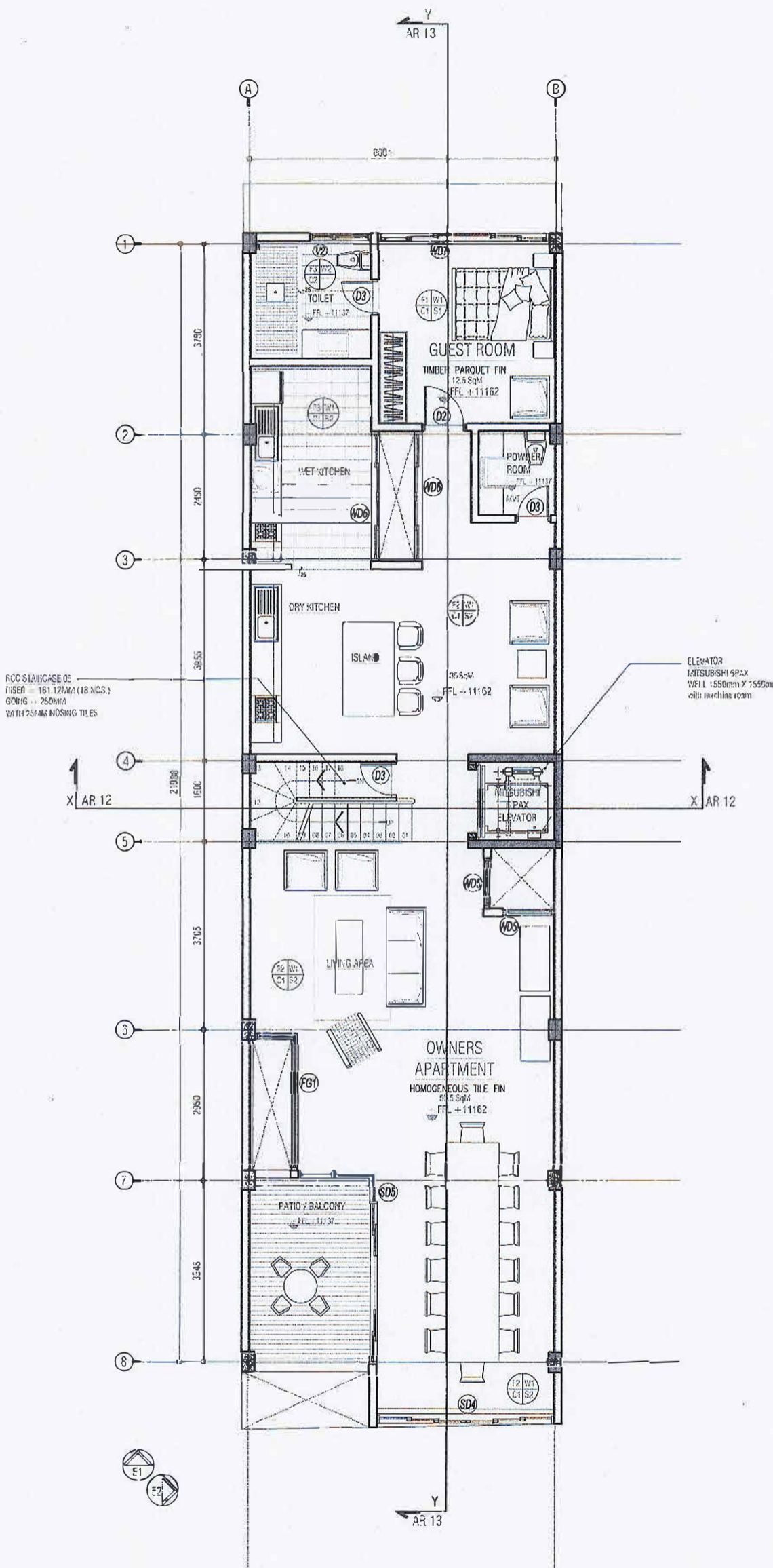
DRAWING TITLE
-SECOND FLOOR PLAN-

CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO. 01

Ministry of Housing & Infrastructure
10079 AR 70
PROJECT NO.
DRAWING NO. 07
DATE ISSUED: 20/05/2016
PROJECT DATE: 20/05/2016
STRUCTURAL CHECKER: A1
Name: Abdulla Rameez VALIDITY: 14.10.15-13.10.36
OR SITES OTHER THAN SPECIFIED ON THIS DRAWING IS PROHIBITED
Registration No: BPR2015022A1 A1-2015-022-001



INTERNAL FINISHES LEGEND				
FLOOR				
F1	- 1200mm X 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS			
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)			
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (MCN SKID)			
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (MCN SKID)			
F5	- INDUSTRIAL PAINT			
SKIRTING				
S1	- 12mm THICK x 100mm HIGH TIMBER SKIRTING FOR BED RM TO COMPLETE WITH WOOD STAIN & VARNISH			
S2	- 12mm THICK x 100mm HIGH TILE SKIRTING			
WALL				
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.			
W2	- 600 X 300 GLOSS HOMOGENEOUS WALL TILES			
CEILING				
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH			
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME			

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

- GENERAL NOTE:
- 150x150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
 - 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
 - RC LINTELS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
 - PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
 - STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENEOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
 - ALL WALLS OF THE LOBBY SHALL BE FINISHED
 - ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600x600mm HOMOGENEOUS TILES APPROVED BY THE ARCHITECT
 - ALL TOILETS, SHOWERS, SLICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
 - TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT
 - ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
 - ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
 - "MATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREEDING
 - ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL.
 - "MASTERTILE 20" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
 - "MASTERTILE 530mm" OR EQUIVALENT SHOULD BE USED FOR GROUT

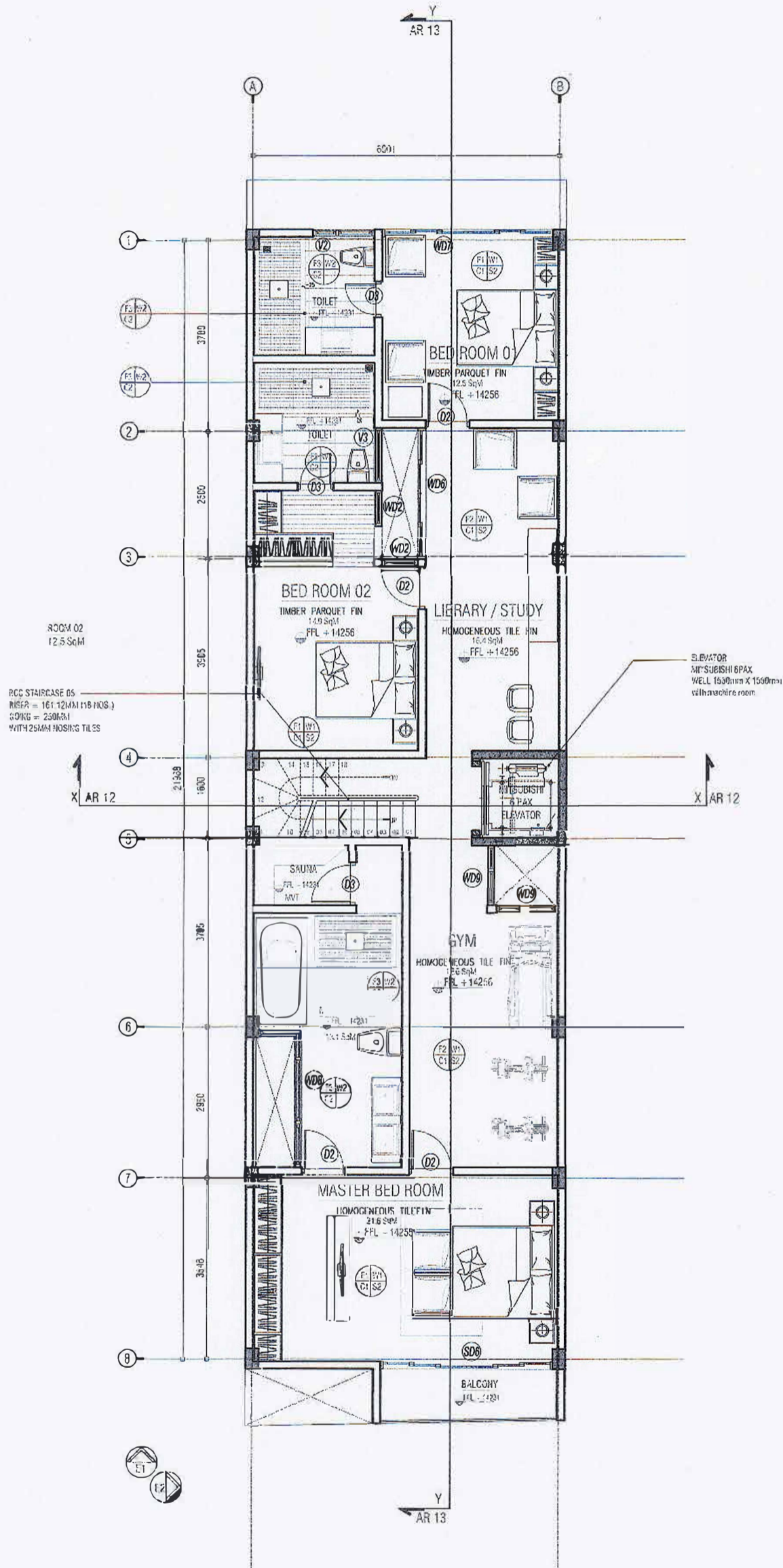
ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

NOTE:
 REINFORCED PARAPET WALL THICKNESS IS 150mm WITH T10@150 B/W VERTICAL AND HORIZONTAL IN 2 LAYERS.
 REINFORCED POOL AND POOL GLUTTER WALL THICKNESS IS 200mm WITH T10@120 B/W VERTICAL AND HORIZONTAL IN 2 LAYERS.
 POOL MEP TO BE DESIGNED AND DETAILED.

THIRD FLOOR PLAN
 SCALE: 1:100

APPROVED
 Housing Development Corporation Ltd.

	PROJECT HULHUMALE' LOT 10079 05 STOREY RESIDENTIAL BUILDING HULHU MALE', K. ATOLL REPUBLIC OF MALDIVES	DRAWING TITLE THIRD FLOOR PLAN	CLIENT ADK HOLDINGS MALDIVES	ARCHITECTURAL DESIGN BY: AHMED THAHSEEN BDR2014028A STRUCTURAL DESIGN BY: ABDULLA RAMEEZ BDR2016038E	STAGE DETAIL DESIGN DRAWINGS ISSUED NO. 01 ISSUED DATE: 20 MAY 2016	REVISION NOTES Ministry of Housing, Urban Planning & Infrastructure ACCREDITED CHECKER STRUCTURAL CHECKER A1 Name: Abdulla Rameez Registration No. BPR2015022A1
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INTERNAL FINISHES LEGEND				
FLOOR				
F1	- 1200mm X 125mm WIDE HW TONGUE & GROOVE TIMBER PLANKS			
F2	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (SEMI-GLOSS FINISH)			
F3	- 300 X 300 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)			
F4	- 600 X 600 CERAMIC HOMOGENEOUS FLOOR TILES (NON SKID)			
F5	- INDUSTRIAL PAINT			
SKIRTING				
S1	- 12mm THICK X 100mm HIGH TIMBER SKIRTING FOR BED ROOM TO COMPLETE WITH WOOD STAIN & VARNISH			
S2	- 12mm THICK X 100mm HIGH TILE SKIRTING			
WALL				
W1	- 120mm THICK CEMENT BLOCKS WITH 15mm TK PLASTER FINISH. EXTERIOR WEATHERPROOF PAINT FINISH ON WALL PUTTY.			
W2	- 600 X 300 GLOSS HOMOGENEOUS WALL TILES			
CEILING				
C1	- EXPOSED SLAB WITH SMOOTH PUTTY FINISH			
C2	- GYPSUM BOARD CEILING ON TIMBER FRAME			

INTERNAL FINISHES CODES				
ROOM / SPACE	FLOOR FINISH CODE	SKIRTING FINISH CODE	WALL FINISH CODE	CEILING FINISH CODE
PARKING	F1	S1	W1	C1
APARTMENT	F2	-	W2	C1
TOILET	F1	-	W1	C1

GENERAL NOTE:

- 150X150 mm CONCRETE PARAPET SHALL BE CASTED AT THE BOTTOM OF ALL EXTERIOR
- 150x150 mm RC MID BEAM SHALL BE CASTED @ MID HEIGHT OF ALL WALLS
- RC INTLS ARE TO BE PROVIDED ON TOP OF ALL DOORS AND WINDOWS
- PROPER WATER PROOFING SOLUTIONS ARE TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER
- STEPS OF THE STAIRCASE SHALL BE FINISHED WITH HOMOGENOUS TILES C/W NOSING TILES & SKIRTING APPROVED BY THE ARCHITECT
- ALL WALLS OF THE LOBBY SHALL BE FINISHED
- ALL FLOORS EXCEPT TOILETS SHALL BE FINISHED WITH 600X600mm HOMOGENOUS TILES APPROVED BY THE ARCHITECT
- ALL TOILETS, SHOWERS, SLICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.
- TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS. ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CLIENT.
- ALL FINISHING MATERIALS SHALL BE APPROVED BY THE ARCHITECT
- ALL EXTERIOR WALLS SHALL BE FULL BLOCK MASONRY C/W PLASTER ON BOTH SIDES
- "WATERSEAL 550" OR EQUIVALENT CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THE WALLS AFTER SCREENING
- ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL.
- "MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
- "MASTERTILE 530m" OR EQUIVALENT SHOULD BE USED FOR GROUT

ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

FOURTH FLOOR PLAN

SCALE 1:100



APPROVED
Housing Development Corporation Ltd.

PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHUMALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-FOURTH FLOOR PLAN

CLIENT
ADK HOLDINGS

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE

DETAIL DESIGN DRAWINGS

ISSUED NO.

01

ISSUED BY

SPACES

DATE ISSUED

20 MAY 2016

PROJECT NO.

10079-AR-09

REVISION NOTES:

10079-AR-09

Ministry of Housing & Infrastructure

07

STRUCTURAL CHECKER

ABDULLA RAMEEZ

20 MAY 2016

STRUCTURAL CHECKER A1

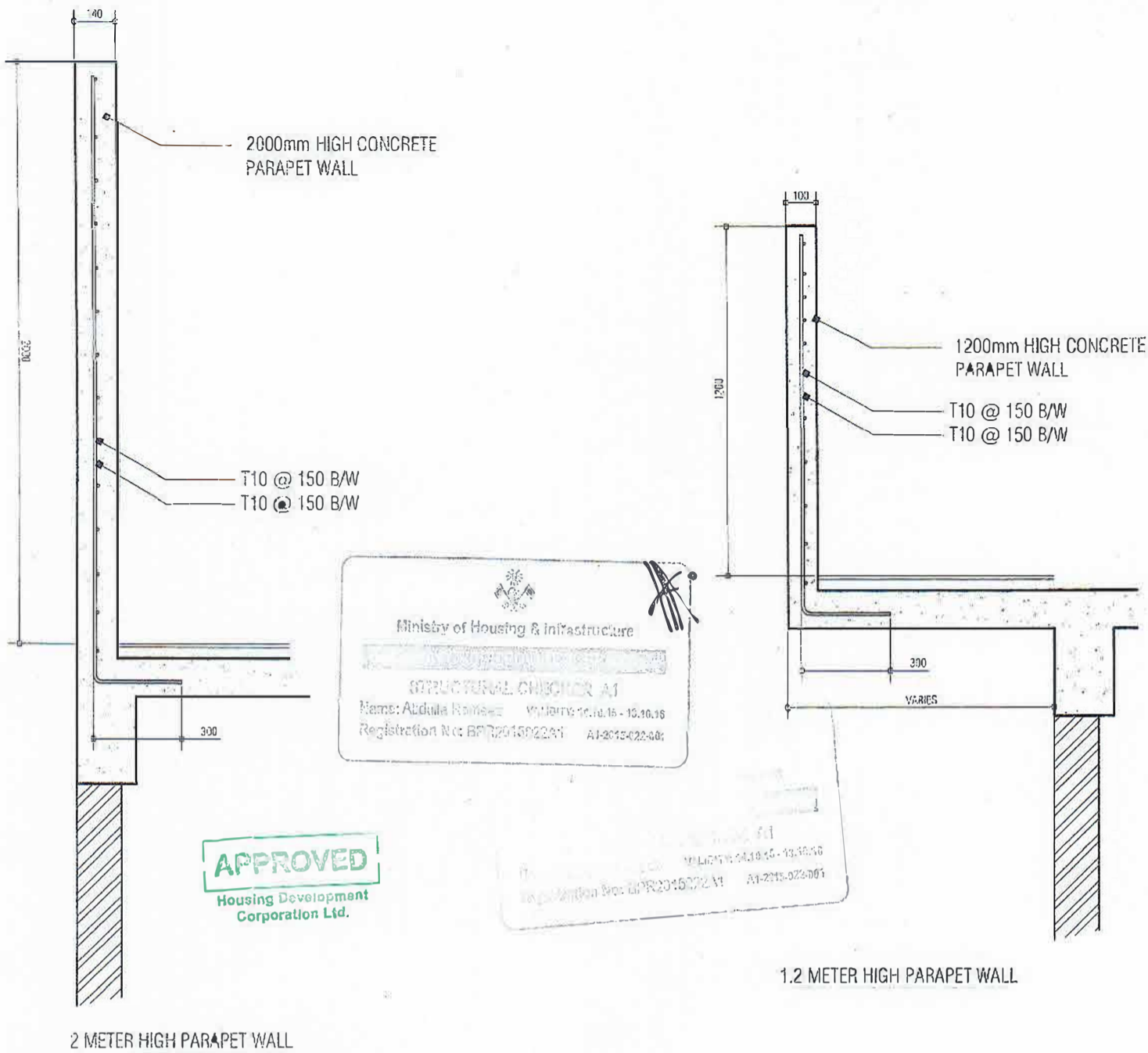
Name: Abdulla Rameez

VALIDITY: 14.10.18 - 13.10.18

Registration No: BDR2016022A1

A1-2016-022-001

TERRACE CONCRETE PARAPET WALL SECTIONAL DETAILS

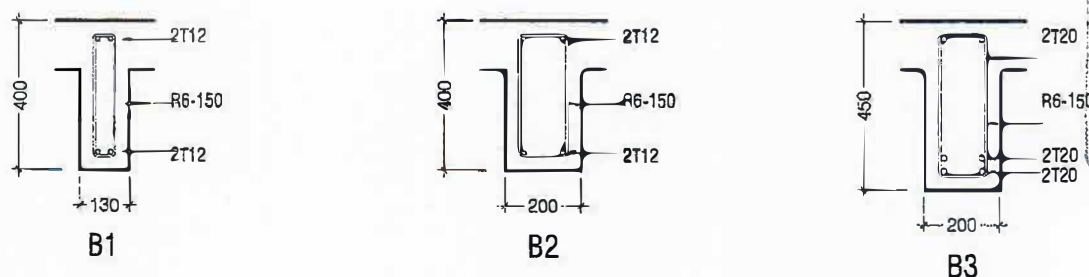


PROJECT	HULHUMALE LOT 10079		
	HULHUMALE, K. ATOLL		
	REPUBLIC OF MALDIVES		
STAGE	DETAILED DESIGN		
ISSUED NO	ISSUED BY	DATE ISSUED	
01	SPACES	20/05/18	
CLIENT	ADK Holdings		
	MALDIVES		
CONTENTS	AS SHOWN		
	PARAPET WALL DETAIL		
ARCHITECTURAL DESIGN BY:	AHMED THAHSEEN		
STRUCTURAL DESIGN BY:	ABDULLA RAMEEZ		
DRAWING NO	PROJECT NO	PROJECT DATE	
10079-ST-41	07	20 MAY 2018	

COLUMN SCHEDULE

	C1	C2	C3	
TERRACE FLOOR			<p>AT GRIDS C-3 & E-3 ONLY</p>	
FIFTH FLOOR				
SECOND TO FOURTH FLOOR				
GROUND & FIRST FLOOR				

BEAM DETAIL



APPROVED

Housing Development Corporation Ltd.

Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez

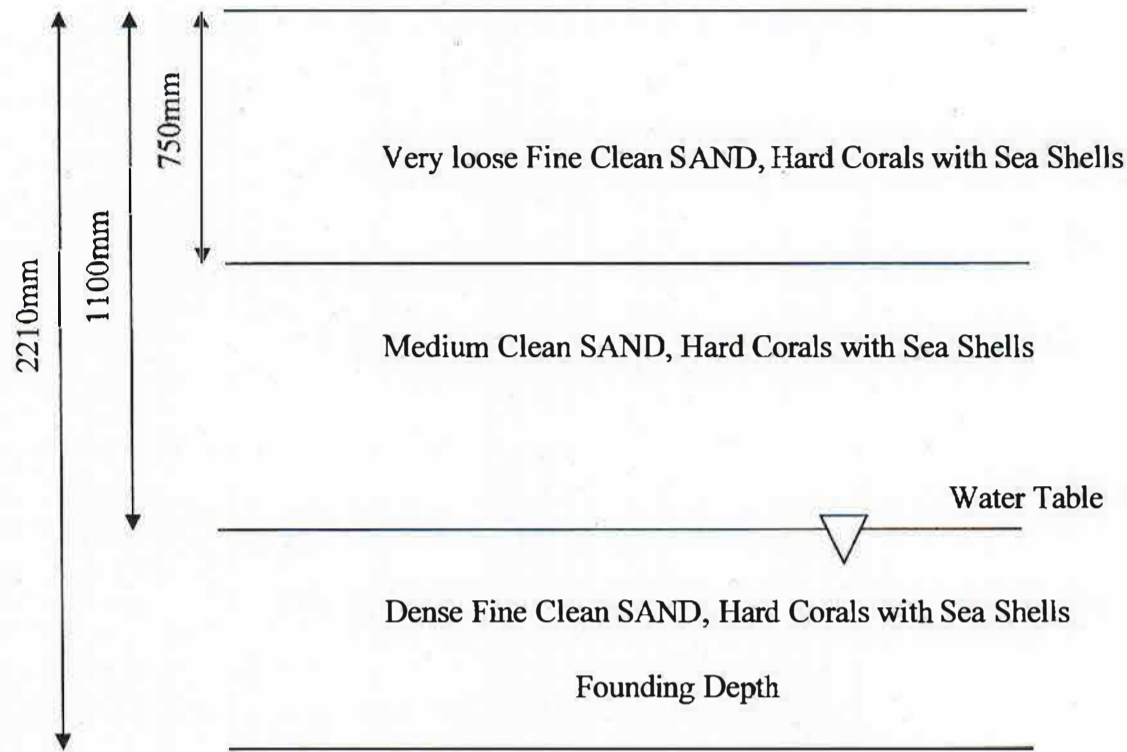
VALIDITY: 10.10.15 - 10.10.18

Registration No: BPR2015022A1 A1-2015-022-001

PROJECT	HULHUMALE LOT 10079		
	HULHUMALE, K. ATOLL		
	REPUBLIC OF MALDIVES		
STAGE	DETAILED DESIGN		
ISSUED NO	ISSUED BY	DATE ISSUED	
01	SPACES	20/05/18	
CLIENT	ADK Holdings		
	MALDIVES		
CONTENTS	AS SHOWN		
	STRUCTURAL DETAILS		
ARCHITECTURAL DESIGN BY:	AHMED THAHSEEN		
STRUCTURAL DESIGN BY:	ABDULLA RAMEEZ		
DRAWING NO	PROJECT NO	PROJECT DATE	
10079-ST-42	07	20 MAY 2018	

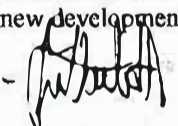
Date: 20 May 2016

VISUAL SOIL INSPECTION REPORT OF HULHUMALE' LOT 10079



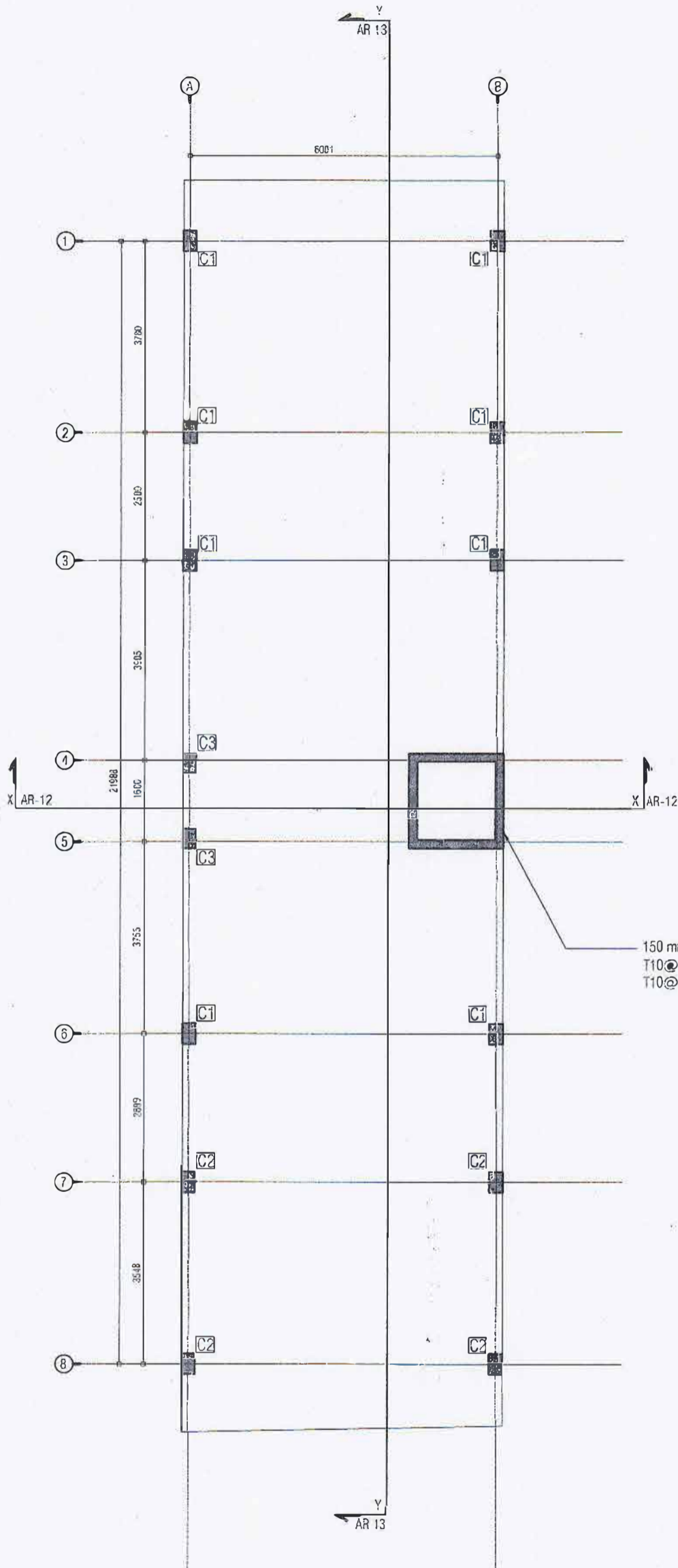
Hulhumale lot 10079 is located in Hulhumale' and visual observation shows that the first layer (-750mm thick) consists of Very Loose Fine Clean SAND, Hard Corals with Sea Shells. From -750mm to -1100mm consists of Medium Clean SAND, Hard Corals with Sea Shells mixture from -1100 to -1500 mm consists of Dense Fine Clean SAND, Hard Corals with Sea Shells. Garbage is not visible in the sample. The water table depth is -1500 mm and the foundation will be located at a depth of -2210 mm. Hence dewatering will be required.

Note: The contractor shall carry out soil investigation of the sites to provide the Client a comprehensive report of the geotechnical information of the site to cover, but not limited to, the type of soils, soil properties, layers, strengths, bearing capacity, lateral sliding resistance of soils, critical voids within the site. The geotechnical information contained in the final document prepared by the contractor will be used to construction of the proposed new developments to ensure bearing capacity of soil before commencing work.


Name: Abdulla Rameez
Registration No: BPR201502241

Abdulla Rameez
Civil/Structural Engineer

APPROVED
Housing Development
Corporation Ltd.



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFITS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m2
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m2
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m2

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

150 mm THK RC WALL
 T10@120 B/W SINGLE LAYER UP TO GROUND FFL
 T10@150 B/W SINGLE LAYER FROM GROUND FFL

COLUMN LOCATION PLAN

SCALE 1:100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 12.10.15 - 13.10.18
 Registration No: BFRZC16022A1 A1-2015-022-001



PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -COLUMN LOCATION PLAN

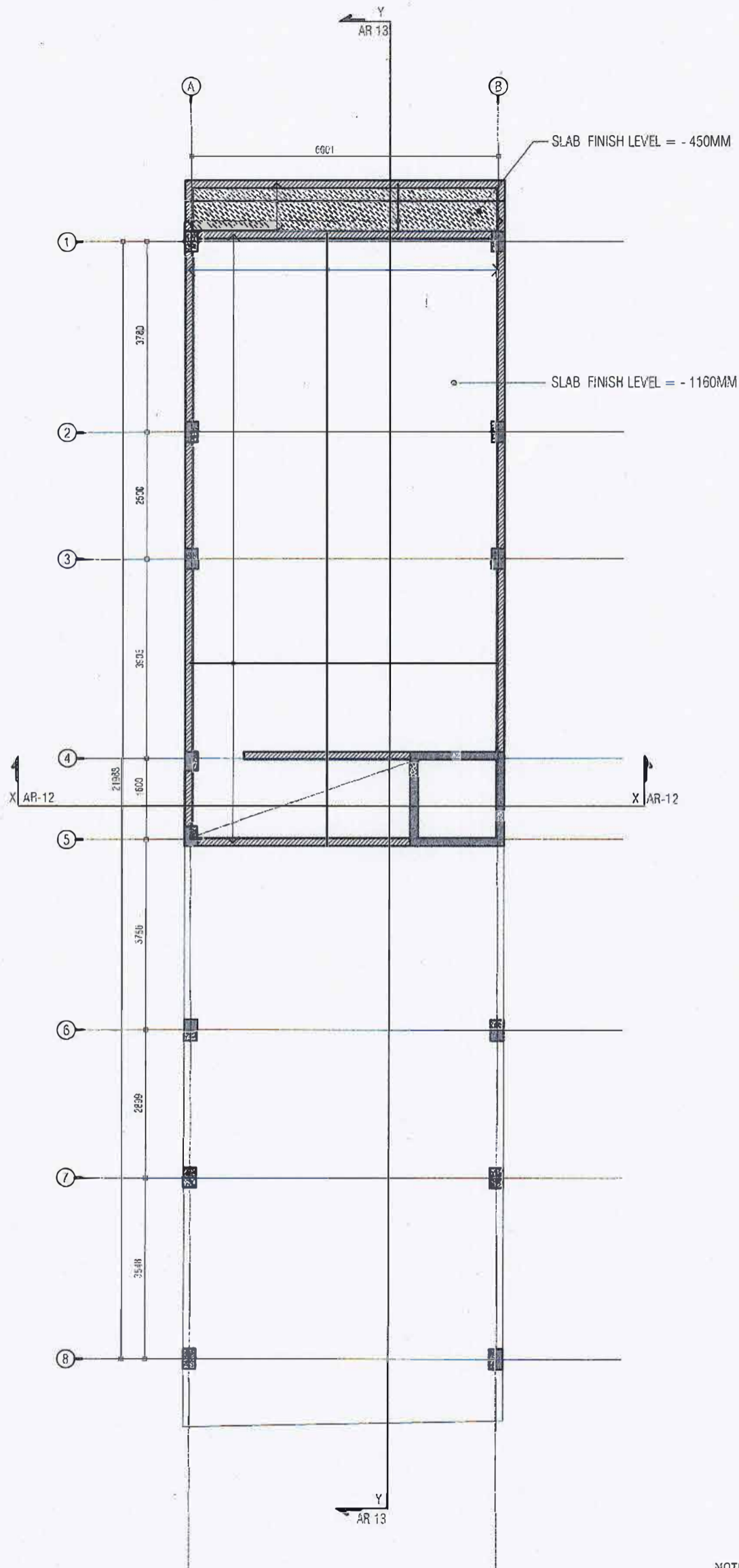
CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE
 DETAIL DESIGN DRAWINGS
 ISSUED NO. 01
 ISSUED BY SPACES
 DATE ISSUED 20/05/2016

DRAWING NO. 10079-ST-31
 PROJECT NO. 07
 PROJECT DATE: 20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFFITS = 35MM
- *C COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

APPROVED
Housing Development Corporation Ltd.

NOTES:

- SLAB THICKNESS = 135 MM
- TOP REINFORCEMENT = T10@150 B/W (AS SHOWN)
- BOTTOM REINFORCEMENT = T10@150 B/W THROUGHOUT

- 150MM BASEMENT RC BOUNDARY WALL FROM RC SLAB TO NGL
- REINFORCEMENT = T10@150 C/C B/W THROUGHOUT (SINGLE LAYER)

BASEMENT FLOOR SLAB REINFORCEMENT PLAN

SCALE 1:100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16

Registration No: GPR2015022A1 A1-2015-022-001



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHU MALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-BASEMENT FLOOR SLAB
REINFORCEMENT PLAN

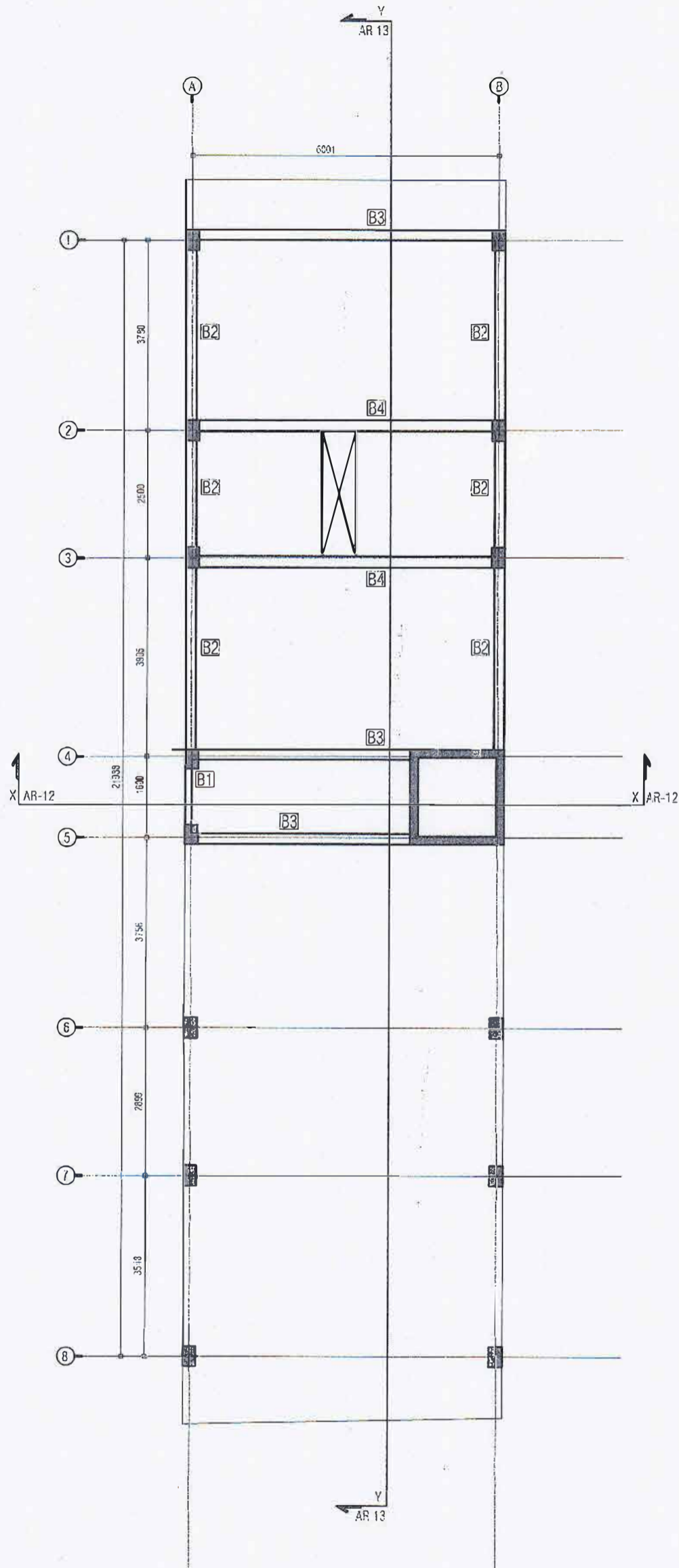
CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO. 01 **ISSUED BY** SPACES **DATE ISSUED** 20/05/2016

DRAWING NO. 10079-ST-32
PROJECT NO. 07
PROJECT DATE: 20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFTS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMCOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

APPROVED
Housing Development Corporation Ltd.

MEZZANINE FLOOR BEAM PLAN

SCALE 1:100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.18

Registration No: BPR2015022A1 A1-2015-022-001

PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHU MALE', K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-MEZZANINE FLOOR BEAM PLAN

CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGNER:
AHMED THAHSEEN
BDR2014028A

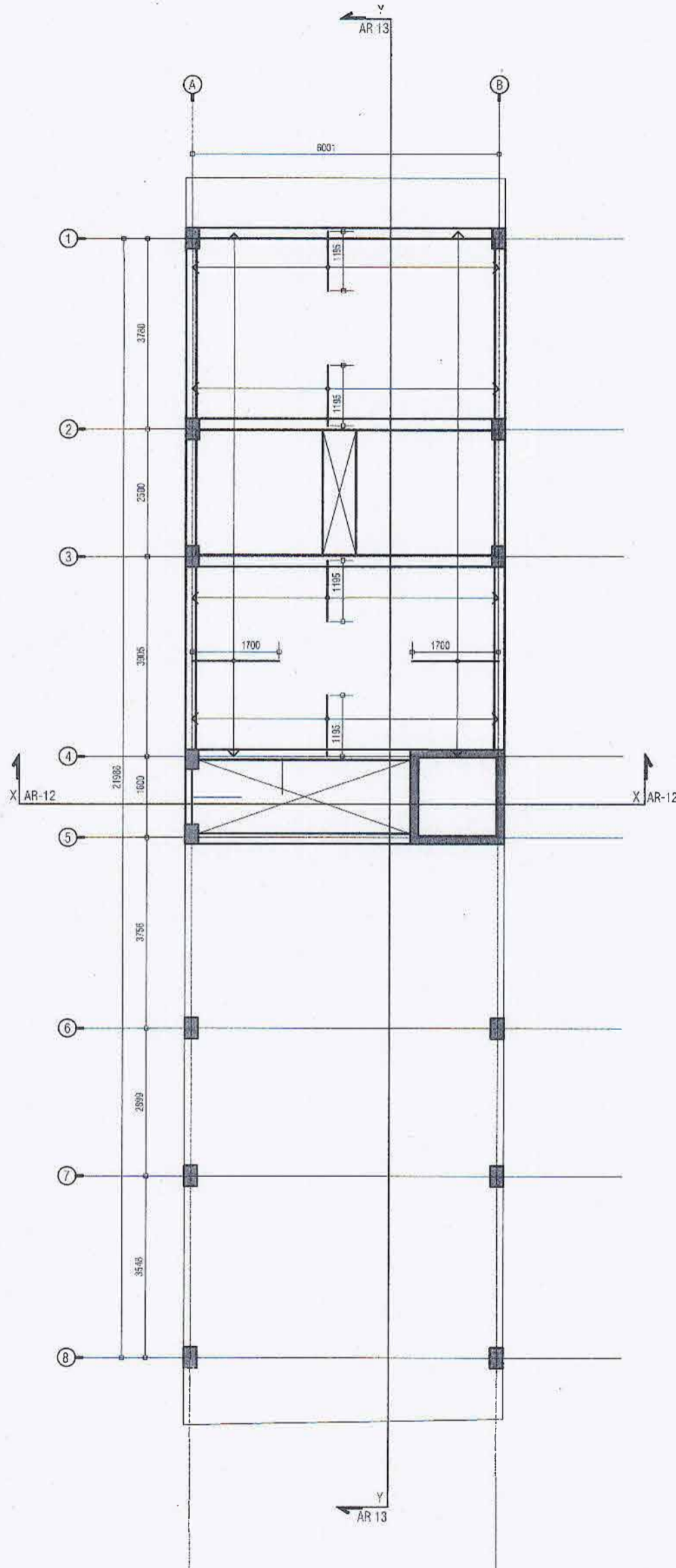
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS

ISSUED NO. 01 **ISSUED BY** SPICES **DATE ISSUED** 20/05/2016

DRAWING NO. 10079-ST-33
PROJECT NO. 07
PROJECT DATE 20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFTS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.



MEZZANINE FLOOR SLAB REINFORCEMENT PLAN

SCALE: 1:100



Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
 Registration No: BPR2015022A1 A1-2165-022-001

NOTES:

- SLAB THICKNESS = 135 MM
- TOP REINFORCEMENT = T10@150 B/W (AS SHOWN)
- BOTTOM REINFORCEMENT = T10@150 B/W THROUGHOUT
- ALL REINFORCEMENTS DISCONTINUE OVER VOIDS



PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -MEZZANINE FLOOR SLAB
 REINFORCEMENT PLAN

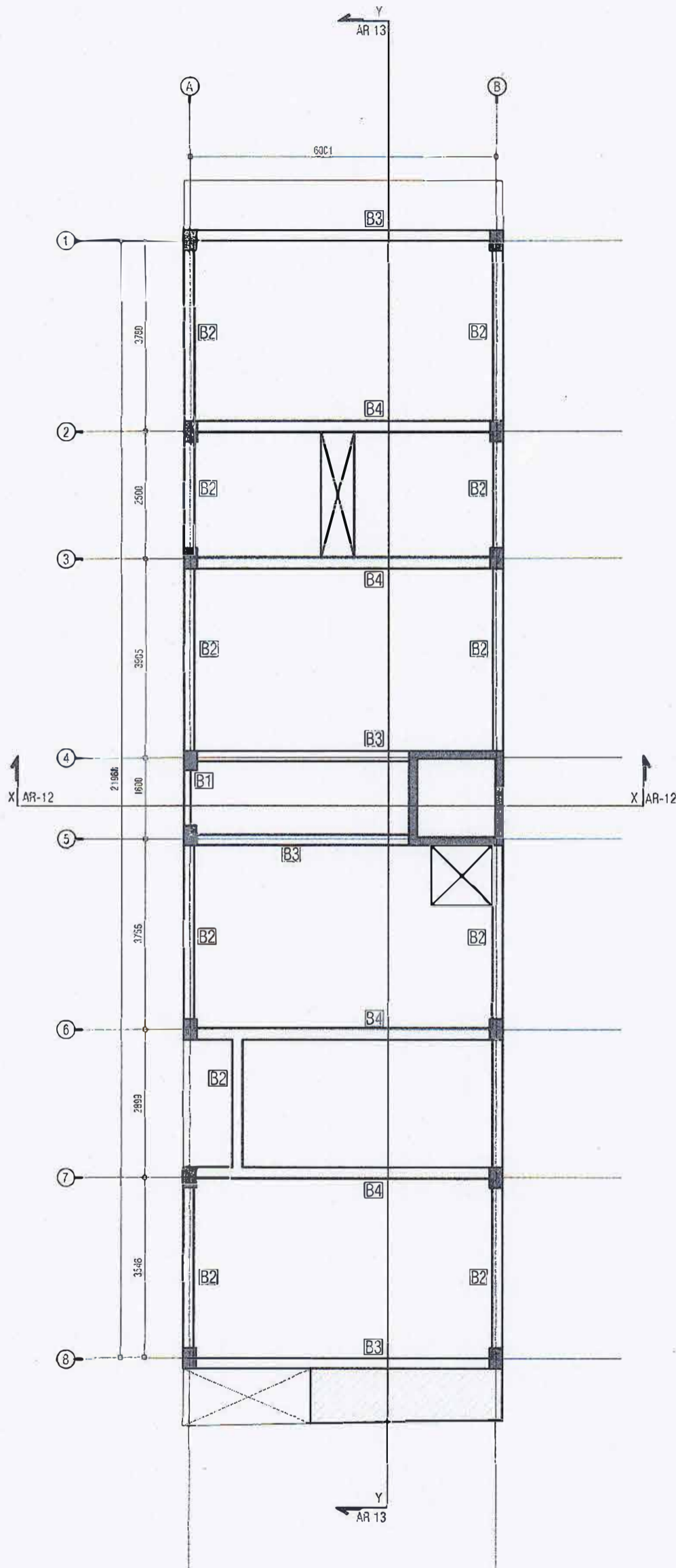
CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE
 DETAIL DESIGN DRAWINGS
 ISSUED NO. ISSUED BY DATE ISSUED
 01 SPACES 20/05/2016

DRAWING NO. 10079-ST-34
 PROJECT NO. 07
 PROJECT DATE: 20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- * SALB = 30MM
- * BEAM SIDES & SOFTS = 35MM
- * COLUMN = 40MM
- * FOUNDATION GROUND SALB AND BEAM = 50MM
- * CONCRETE GRADE FRO DESIGN = 25N/m²
- * STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- * STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALIST'S DETAIL.

APPROVED
Housing Development Corporation Ltd.

BEAM PLAN FIRST TO FOURTH

SCALE 1:100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.18
Registration No: BPR2015022A1 A1-2015.022-001



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING

HULHU MALE, K ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-BEAM PLAN FIRST TO FOURTH
FLOOR

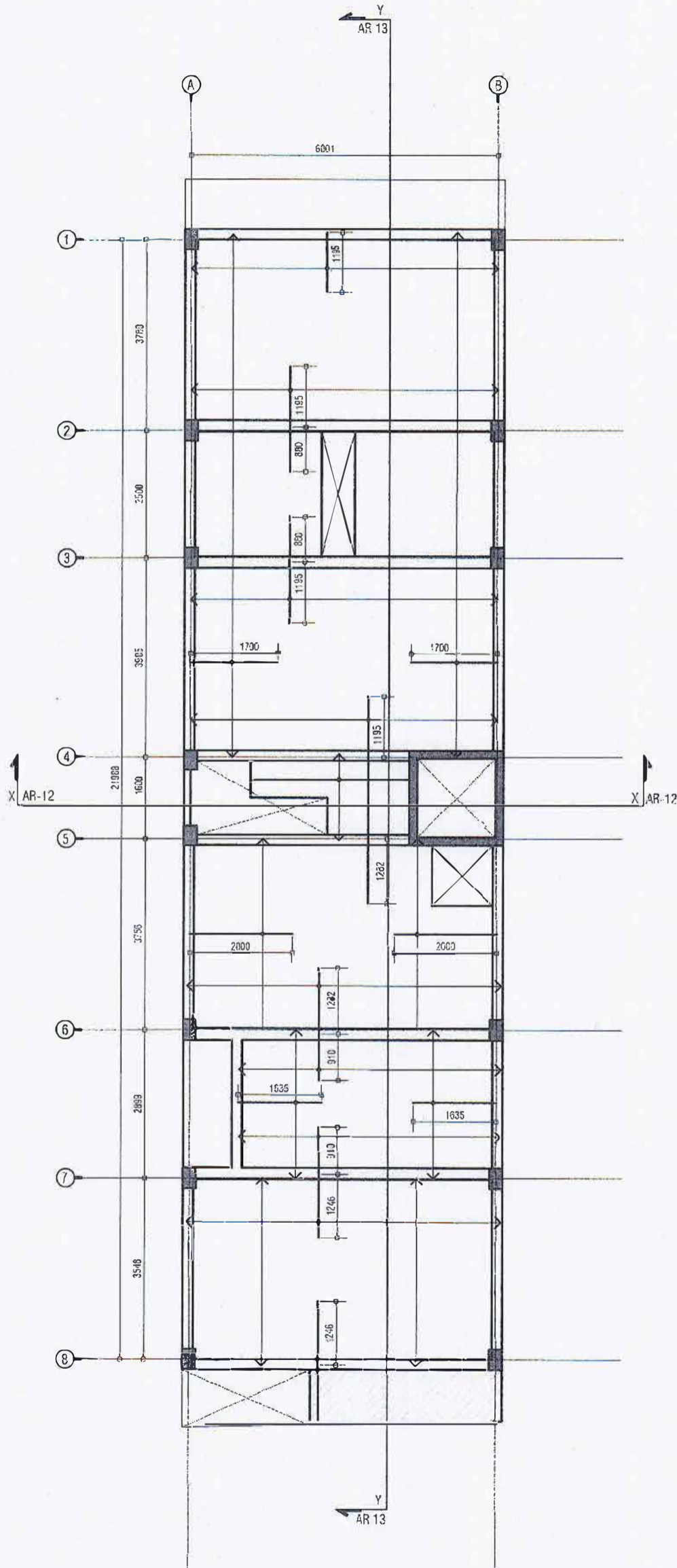
CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO: 01 ISSUED BY: SPACES DATE ISSUED: 20/05/2016

DRAWING NO:
10079-ST-34
PROJECT NO:
07
PROJECT DATE:
20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFFITS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER:

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2566) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

APPROVED

Housing Development Corporation Ltd.

FIRST FLOOR SLAB REINFORCEMENT PLAN

SCALE : 100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16

Registration no: BPR2015022A1 A1-2015-022-001

NOTES:

- OTHER SLAB THICKNESS = 135 MM
- TOP REINFORCEMENT = T10@150 B/W (AS SHOWN)
- BOTTOM REINFORCEMENT = T10@150 B/W THROUGHOUT
- ALL REINFORCEMENTS DISCONTINUE OVER VOIDS

- SLAB THICKNESS OF SHADED REGION = 150MM
- TOP AND BOTTOM REINFORCEMENT = T10@150 C/C B/W THROUGHOUT



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -FIRST FLOOR SLAB
 REINFORCEMENT PLAN

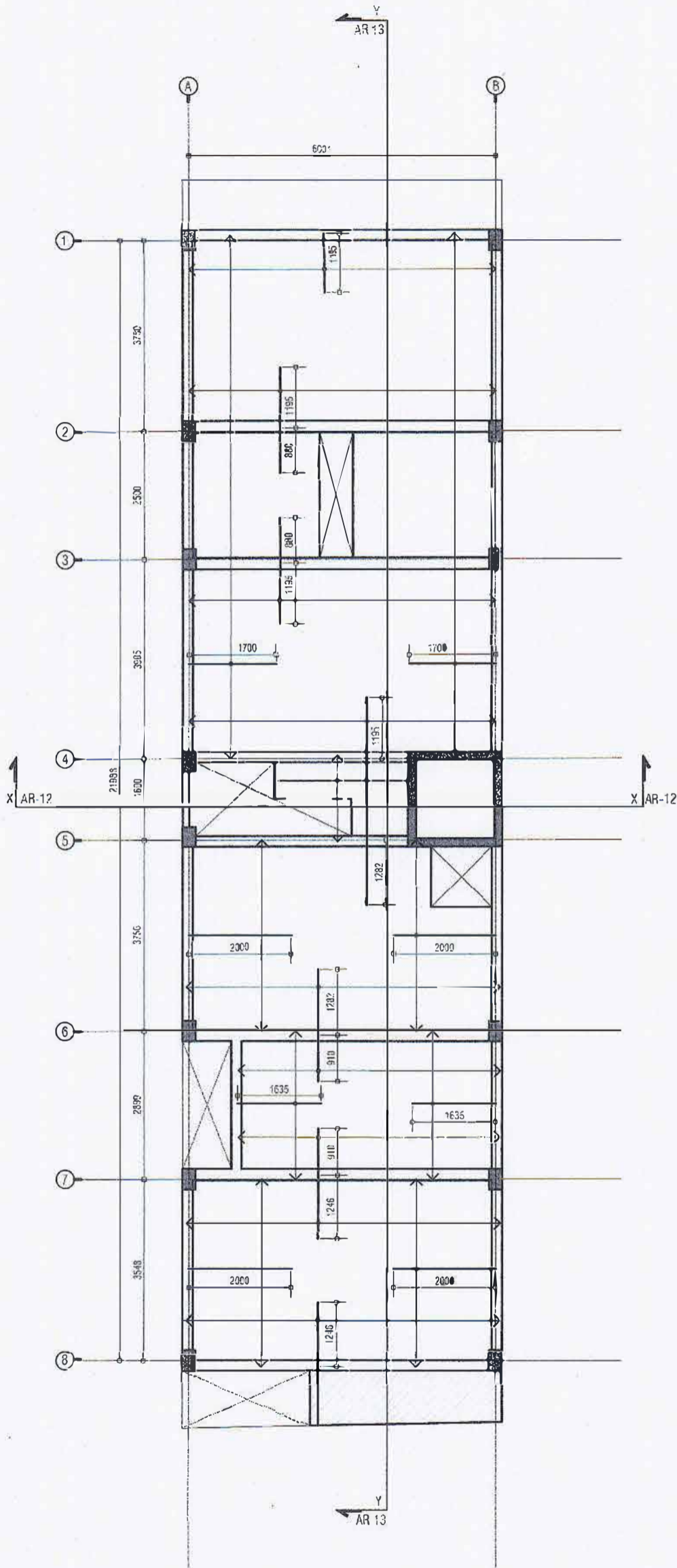
CLIENT
 ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

STAGE
 DETAIL DESIGN DRAWINGS
ISSUED NO. 01 **ISSUED BY** SPACES **DATE ISSUED** 20/05/16

DRAWING NO. 10079-ST-35
PROJECT NO. 07
PROJECT DATE 20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFFITS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALIST'S DETAIL.



SECOND TO FOURTH FLOOR SLAB REINFORCEMENT PLAN

SCALE : 100

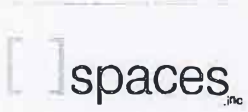


Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 12.10.18
Registration No: BPR2016022A1 A1-2015-002-001

- NOTES:**
- OTHER SLAB THICKNESS = 135 MM
 - TOP REINFORCEMENT = T10@150 B/W (AS SHOWN)
 - BOTTOM REINFORCEMENT = T10@150 B/W THROUGHOUT
 - ALL REINFORCEMENTS DISCONTINUE OVER VOIDS
- SLAB THICKNESS OF SHADED REGION = 150MM
 - TOP AND BOTTOM REINFORCEMENT = T10@150 C/C B/W THROUGHOUT



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING

HULHU MALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-SECOND TO FOURTH FLOOR SLAB
REINFORCEMENT PLAN

CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A

STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS

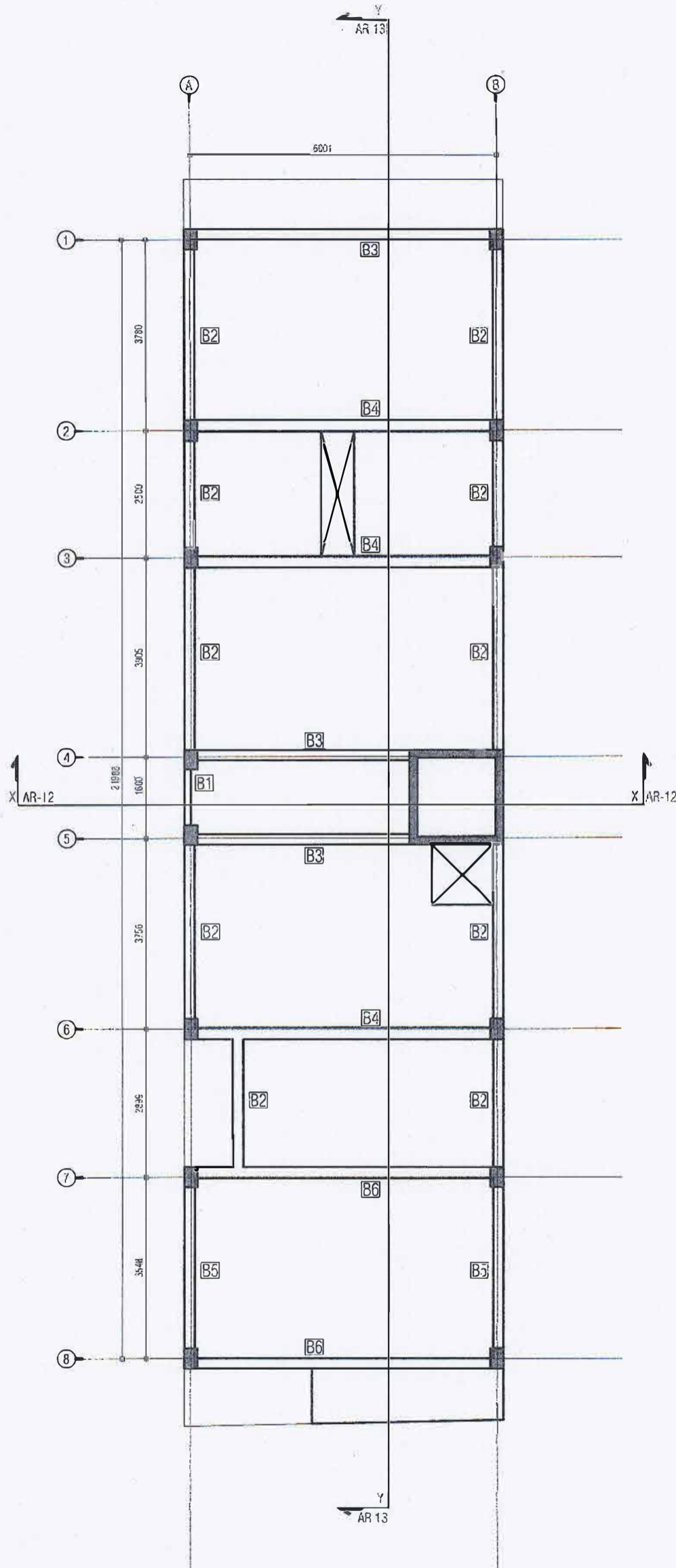
ISSUED NO. 01
ISSUED BY SPACES
DATE ISSUED 20/05/2016

DRAWING NO.
10079-ST-36

PROJECT NO.
07

PROJECT DATE
20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFTS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
- *CONCRETE GRADE FRO DESIGN = 25N/m²
- *STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- *STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:


CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

APPROVED
Housing Development Corporation Ltd.

TERRACE BEAM PLAN

SCALE 1:100




 Ministry of Housing & Infrastructure
 MALDIVES
STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.16
 Registration No: BPR2015022A1 A1-2015-022-001

PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
 HULHU MALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
 -TERRACE BEAM PLAN

CLIENT
 ADX HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
 AHMED THAHSEEN
 BDR2014028A
STRUCTURAL DESIGN BY:
 ABDULLA RAMEEZ
 BDR2016038E

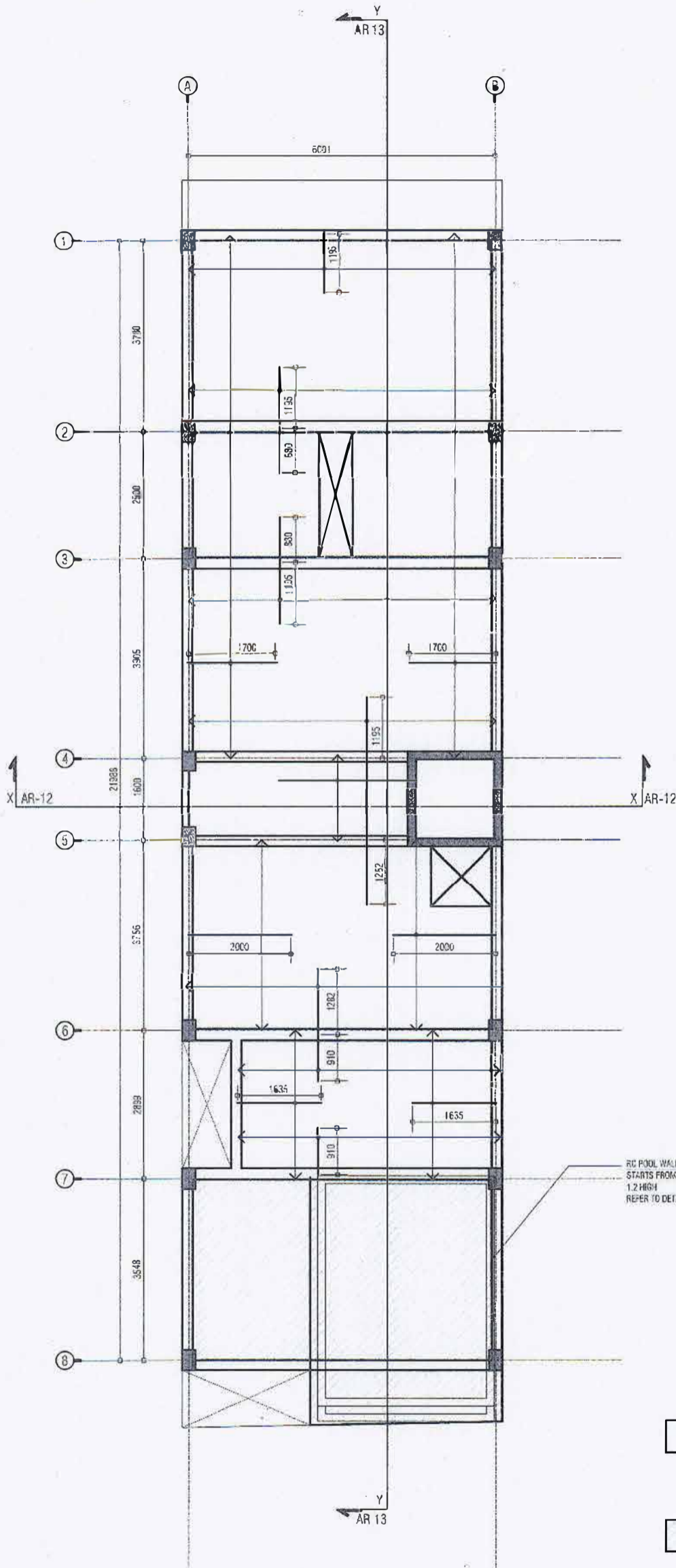
STAGE
 DETAIL DESIGN DRAWINGS

ISSUED NO.	ISSUED BY	DATES/ISSUED
01	SPACES	20052016

DRAWING NO:
 10079- ST - 37
PROJECT NO:
 07
PROJECT DATE
 20 MAY 2016

REVISION NOTES:





GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- * SALB = 30MM
- * BEAM SIDES & SCFITS = 35MM
- * COLUMN = 40MM
- * FOUNDATION GROUND SALB AND BEAM = 50MM
- * CONCRETE GRADE FRO DESIGN = 25N/m²
- * STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- * STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAF LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALIST'S DETAIL.



NOTES:

- SLAB THICKNESS = 135 MM
- TOP REINFORCEMENT = T10@150 B/W (AS SHOWN)
- BOTTOM REINFORCEMENT = T10@150 B/W THROUGHOUT

- SLAB THICKNESS OF SHADED REGION = 200 MM
- TOP REINFORCEMENT = T10@120 B/W THROUGHOUT
- BOTTOM REINFORCEMENT = T120@150 B/W THROUGHOUT

REINFORCED PARAPET WALL THICKNESS IS 150mm WITH T10@150 B/W VERTICAL AND HORIZONTAL IN 2 LAYERS.
 REINFORCED POOL AND POOL GUTTER WALL THICKNESS IS 200mm WITH T10@120 B/W VERTICAL AND HORIZONTAL IN 2 LAYERS.

TERRACE SLAB REINFORCEMENT PLAN

SCALE 1 : 100



Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
 Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.18
 Registration No: BPR2015022A1 A1-2015-021-001



PROJECT
HULHUMALE' LOT 10079
 05 STOREY RESIDENTIAL BUILDING
 HULHUMALE, K. ATOLL
 REPUBLIC OF MALDIVES

DRAWING TITLE
-TERRACE SLAB REINFORCEMENT PLAN

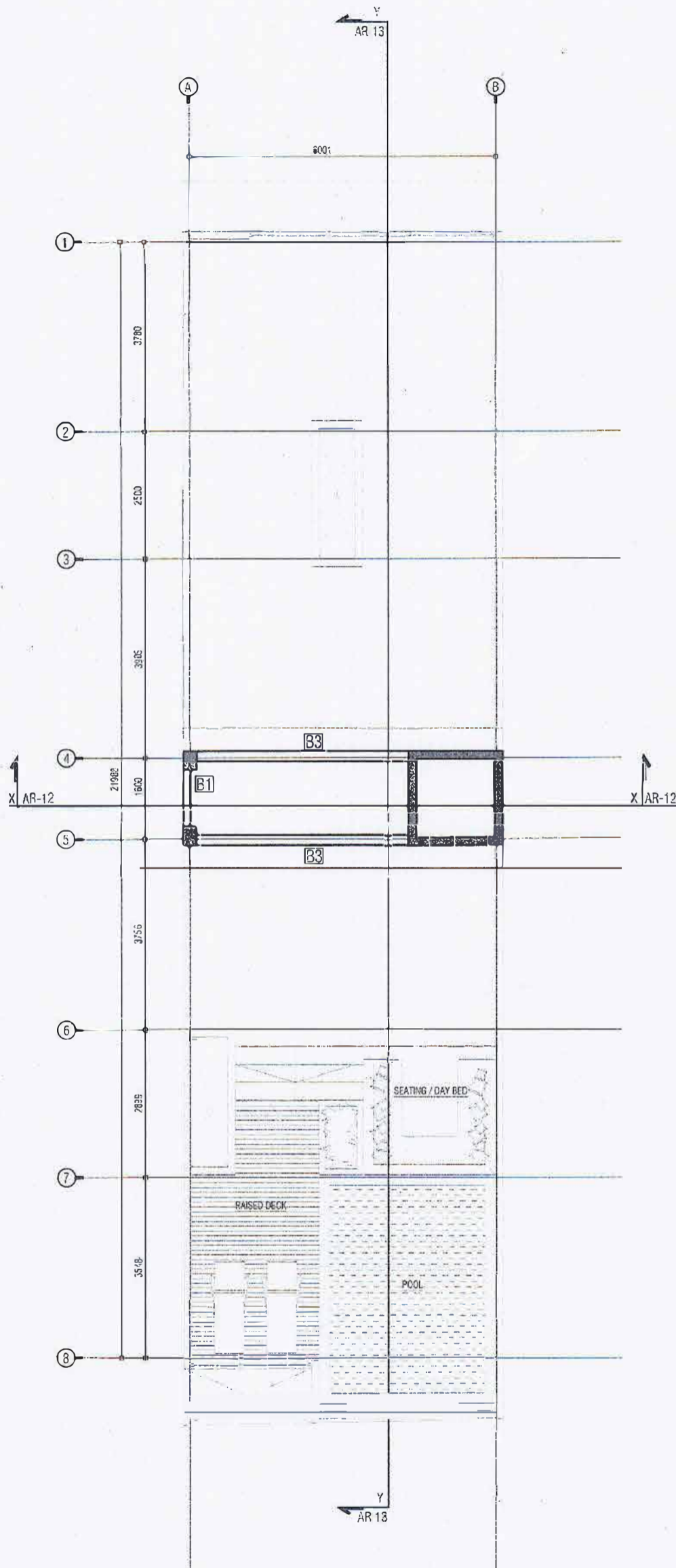
CLIENT
ADK HOLDINGS
 MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
 BDR2014028A
 STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
 BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
 ISSUED NO. ISSUED BY DATE ISSUED
 01 SPACES 20/05/2016

DRAWING NO:
10079-ST-38
 PROJECT NO:
 07
 PROJECT DATE:
20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- * SALB = 30MM
- * BEAM SIDES & SOFITS = 35MM
- * COLUMN = 40MM
- * FOUNDATION GROUND SALB AND BEAM = 50MM
- * CONCRETE GRADE FRO DESIGN = 25N/m²
- * STEEL GRADE (HIGH - YIELD DEFORMED) = 415N/m²
- * STEEL GRADE (MILD SMOOTH ROUND) = 250N/m²

RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
- * 12mm Ø BARS = 500mm
- * 16mm Ø BARS = 650mm
- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.

APPROVED
Housing Development Corporation Ltd.

ROOF BEAM PLAN

SCALE 1 : 100



Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
Name: Abdulla Rameez VALUITY: 14.10.15 - 12.10.16
Registration No: BPR2015022A1 A1-2015-022-001

NOTES:

- SLAB THICKNESS OF SHADED REGION 150MM
- OTHER SLAB THICKNESS = 135 MM
- TOP AND BOTTOM SLAB REINFORCEMENT = T10@150 BW THROUGHOUT



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHU MALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-ROOF BEAM PLAN

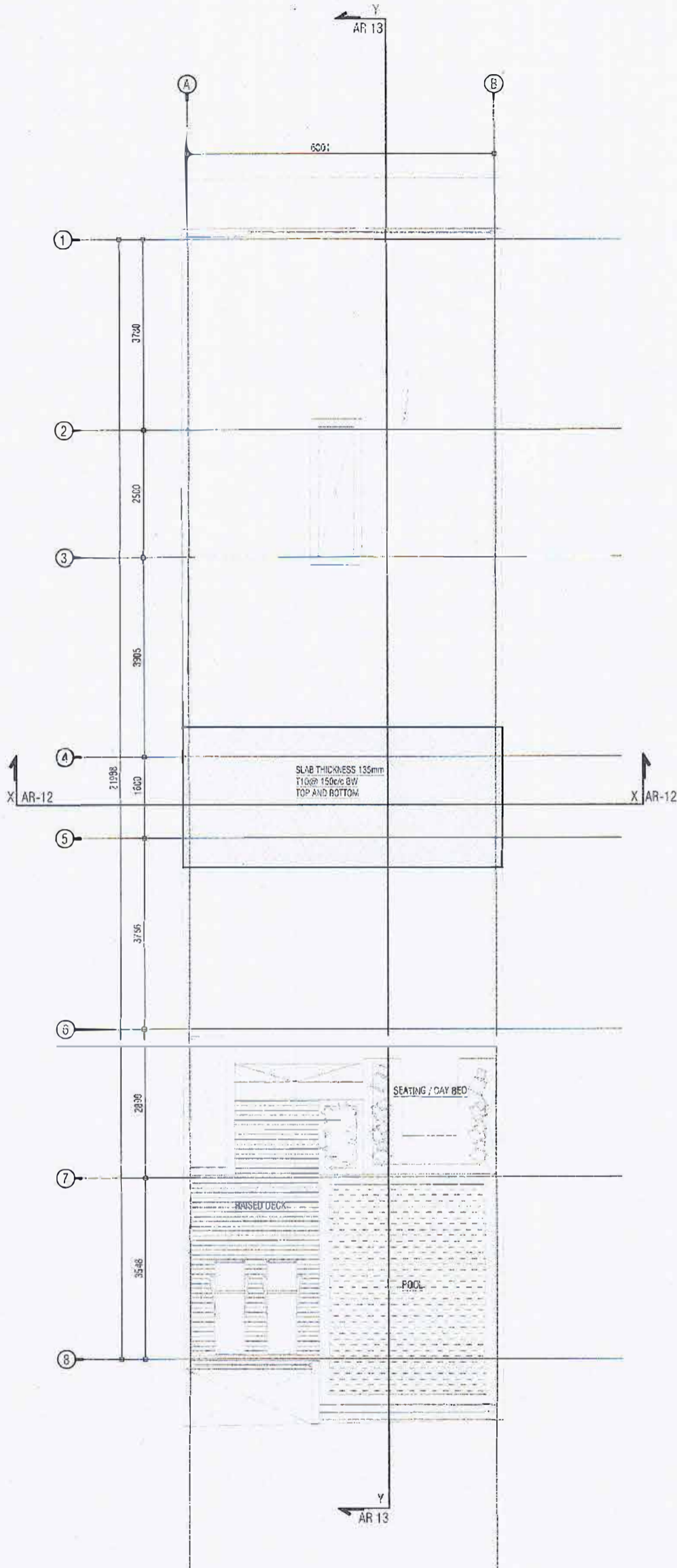
CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO. 01
ISSUED BY SPACES
DATE ISSUED 20/05/2016

DRAWING NO:
10079- ST - 39
PROJECT NO:
07
PROJECT DATE:
20 MAY 2016

REVISION NOTES:



GENERAL NOTE:

CONCRETE COVER TO RFMNT:

- *SALB = 30MM
- *BEAM SIDES & SOFITS = 35MM
- *COLUMN = 40MM
- *FOUNDATION GROUND SALB AND BEAM = 50MM
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RFMNT LAP LENGTHS:

- * 10mm Ø BARS = 400mm
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- * 20mm Ø BARS = 900mm

TIMBER

ALL TIMBER MEMBERS SHOULD BE OF TREATED TIMBER GRADE = C30(BS2568) UNLESS OTHERWISE STATED

WATER PROOFING:

CONCRETE SURFACES EXPOSED TO GROUND, RAIN AND SEA WATER SHOULD BE TREATED WITH WATER PROOFING APPLICATION ACCORDING TO SPECIALISTS'S DETAIL.



ROOF SLAB REINFORCEMENT PLAN

SCALE 1: 100



Ministry of Housing & Infrastructure

STRUCTURAL CHECKER A1

Name: Abdulla Rameez VALIDITY: 14.10.15 - 13.10.18

Registration No: BPR201502ZA1 A1-2015-022-001

NOTES:

- SLAB THICKNESS OF SHADED REGION 150MM
- OTHER SLAB THICKNESS = 135 MM
- TOP AND BOTTOM SLAB REINFORCEMENT = T10@150 BW THROUGHOUT



PROJECT
HULHUMALE' LOT 10079
05 STOREY RESIDENTIAL BUILDING
HULHU MALE, K. ATOLL
REPUBLIC OF MALDIVES

DRAWING TITLE
-ROOF SLAB REINFORCEMENT PLAN

CLIENT
ADK HOLDINGS
MALDIVES

ARCHITECTURAL DESIGN BY:
AHMED THAHSEEN
BDR2014028A
STRUCTURAL DESIGN BY:
ABDULLA RAMEEZ
BDR2016038E

STAGE
DETAIL DESIGN DRAWINGS
ISSUED NO. 01
ISSUED BY SPACES
DATE ISSUED 20/05/2016

DRAWING NO:
10079- ST - 40
PROJECT NO:
07
PROJECT DATE
20 MAY 2016

REVISION NOTES:

Our Ref: MR-MISC/2016/001

17th October, 2016

Mr. Thoriq Ibrahim
The Minister
Ministry of Environment and Energy
Ameenee Magu, Maafannu,
Malé-20392 , Republic of Maldives

Dear Mr. Ibrahim,

Re: EIA – ENVIRONMENTAL IMPACT ASSESSMENT FOR PROPOSED SIX STOREY BUILDING WITH A BASEMENT, LAND LOT A-10079 HULHUMALÈ, MALDIVES

As the proponent responsible for environmental compliance for the above project, I hereby give our financial commitment to implement the monitoring plan, undertake the mitigation measures recommended and to comply with the issues identified in the Environmental Impact Assessment Report submitted to your agency.

Yours sincerely,



Maana Rafiu

Male' Water & Sewerage Company Pvt Ltd

Water Quality Assurance Laboratory

FEN Building 5th Floor, Machangoalhi, Ameenemagu, Male', Maldives
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

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WATER QUALITY TEST REPORT

Test Report No: 301226/2016/05

Customer Informations :

Mr. Mahmood Riyaz

H. Hithifaiy,

Hithah Finivaa magu,

Male'

Rep.of Maldives

Date: 27/09/2016

Sample Description / Location~	LOT A10079	TEST METHOD	UNIT
Sample Type~	Ground water		
Sampled Date~	20/9/2016		
Sample Received Date	21/9/2016		
Test Requisition Form No.	900165678		
Sample No.	826451		
Date of Analysis	21/9/2016 -26/9/2016		
PARAMETER	ANALYSIS RESULT		
Physical Appearance	Cloudy with particles	Visual	-
Conductivity	948	Method 2510 B. (adapted from Standard methods for the examination of water and waste water, 22nd edition)	µS/cm
pH	7.92	Method 4500-H+ B. (adapted from Standard methods for the examination of water and waste water, 21st edition)	-
Salinity	0.47	Method 2520 B. (adapted from Standard methods for the examination of water and waste water, 21st edition)	‰
Hardness, Total	560	HACH Method 8213	mg/L
Temperature	21.0	Electrometry	°C
Total Suspended Solids (TSS)	888	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L

Keys:

‰: Parts Per Thousand, mg/L: Milligram Per Liter, µS/cm: Micro Siemens per centimeter, °C: Degree Celcius

LoQ: Limit of Quantification

Checked by:

Afnan Farooq
Laboratory Executive

Approved by:

Mohamed Eyman
Senior Technical Officer

Notes:

Sampling Authority: Sampling was not done by MWSC Laboratory

This report shall not be reproduced except in full, without written approval of MWSC

This test report is ONLY FOR THE SAMPLES TESTED.

~ Information Supplied by the customer

*****END OF THE REPORT*****

Annex 7: Scoping meeting Attendentlist

Environmental Protection Agency
Male', Rep of Maldives

Meeting: Hulhumale' 10079 6 storey building with basement
Date: 7/9/16
Time: 10:00

MEETING ATTENDANCE

	Name	Designation	Office	Email	Phone No.	Signature
01	ZINAF	SPUR URBAN PLANNER	HDC	zinaf@hdc.com.mv	7674221	
02	NAFIZ	Senior Municipal OFFICER	HDC	nafiz@hdc.com.mv	7787156	
03	Mahmood Rajeev	Consultant	Consultant	Mahmood.vijay@gmail.com	7770307	
04	Ibrahim Aslam	Technician	stelco	Ibrahim Aslam@stelco.com.mv	7779886	
05	AMJAD MOHAMED	E. Engineer	stelco	amjad.mohamed@stelco.com.mv	7783632	
06	HANNA THAHREEN	ARCHITECT	SPACFS	hahsyn@gmail.com	7773846	
07	AHMED SHAMEEM	representative of Man.			7586586	
08	Fathimath Reema	Director	EPA		3335949	
09	Yusef Ahmed	Director EA	EPA	yusef.ahmed@epa.gov.mv	7903373	
10						